Cornell University

ANNOUNCEMENTS

New York State College of *Agriculture*

1969-70

A Statutory College of the State University,
At Cornell University, Ithaca, New York

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Cornell Academic Calendar

	1969-70*
Registration, new students	Th, Sept. 11
Registration, old students	F, Sept. 12
Fall term instruction begins, 7:30 A.M.	M, Sept. 15
Midterm grade reports due	S, Oct. 25
Thanksgiving recess:	
Instruction suspended, 1:10 P.M.	W, Nov. 26
Instruction resumed, 7:30 A.M.	M, Dec. 1
Fall term instruction ends, 1:10 P.M.	S, Dec. 20
Christmas recess	
Independent study period begins	M, Jan. 5
Final examinations begin	M, Jan. 12
Final examinations end	T, Jan. 20
Intersession begins	W, Jan. 21
Registration, new students	Th, Jan. 29
Registration, old students	F, Jan. 30
Spring term instruction begins, 7:30 A.M.	M, Feb. 2
Deadline: changed or make-up grades	M, Feb. 9
Midterm grade reports due	S, Mar. 14
Spring recess:	
Instruction suspended, 1:10 P.M.	S, Mar. 28
Instruction resumed, 7:30 A.M.	M, Apr. 6
Spring term instruction ends, 1:10 P.M.	S, May 16
Independent study period begins	M, May 18
Final examinations begin	M, May 25
Final examinations end	T, June 2
Commencement Day	M, June 8
Deadline: changed or make-up grades	M, June 15

* The dates shown in the Academic Calendar are subject to change at any time by official action of Cornell University.

The courses and curricula described in this *Announcement,* and the teaching personnel listed therein, are subject to change at any time by official action of Cornell University

CORNELL UNIVERSITY ANNOUNCEMENTS

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As of January 1, 1969

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Stanley Whitson Warren, Ph.D., Farm Management.
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Madison Johnston Wright, Ph.D., Agronomy.

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Paul Joseph Zwerman, Ph.D., Soil Conservation.

Associate Professors

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Harry Robert Ainslie, Ph.D., Animal Science.
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Otis Freeman Curtis, Jr., Ph.D., Pomology, Geneva.
Alexander Cochran Davis, Ph.D., Entomology, Geneva.
Hollis Rexford Davis, M.S., Agricultural Engineering.
Russell C. Deckert, M.F., Forestry.
Bernard Emile Dethier, Ph.D., Agricultural Climatology.
Robert Shaft Dickey, Ph.D., Plant Pathology.
Desmond Daniel Dolan, Ph.D., Plant Introduction, Geneva.
William Emerson Drake, Ph.D., Agricultural Education.
Edward Oscar Eaton, Ph.D., Agricultural Engineering.
Alfred Ward Eipper, Ph.D., Fishery Biology.
John Murray Elliot, Ph.D., Animal Science.
Milton Harlan Erdmann, Ph.D., Field Crops.
Eugene Curtis Erickson, Ph.D., Rural Sociology.
Elmer Ellis Ewing, Ph.D., Vegetable Crops.
Charles Clayton Fischer, M.S., Floriculture.
Olan Dean Forker, Ph.D., Marketing.
Raymond Thomas Fox, Ph.D., Floriculture.

George Free, M.S., Soil Technology.
Donald K. Freebairn, Ph.D., Agricultural Economics.
Ronald Bay Furry, Ph.D., Agricultural Engineering.
Harrison Adam Geiselmann, Ph.D., Mathematics Education.
Dana Clement Goodrich, Jr., Ph.D., Marketing.
D. Bob Gowin, Ph.D., Educational Foundations.
David Leon Grunes, Ph.D., Soil Science.
Richard William Guest, M.S., Agricultural Engineering.
Lonnie Ross Hackler, Ph.D., Biochemistry, Geneva.
Martin Bernard Harrison, Ph.D., Plant Pathology.
Dennis August Hartman, Ph.D., Animal Science.
Milton Ellsworth Hislop, M.S., Cooperative Extension and Extension Representative.
Joseph Frederick Hodgson, Ph.D., Soil Science.
Douglas Emerson Hogue, Ph.D., Animal Science.
John William Ingram, Jr., Ph.D., Botany.
Wilmot Wheeler Irish, M.S., Agricultural Engineering.
Donald Leo Jewett, M.S., Cooperative Extension and Extension Representative.
Orvis Franklin Johndrew, Jr., M.S., Poultry Science.
Norman Elden Johnson, Ph.D., Entomology.
Warren Thurston Johnston, Ph.D., Entomology and Plant Pathology.
Edward Davis Jones, Ph.D., Plant Pathology.
Louis William Kaiser, B.F.A., in Radio, Communication Arts.
William Tinsley Keeton, Ph.D., Biology.
John Merriam Kingsbury, Ph.D., Botany.
John Paul Kramer, Ph.D., Entomology.
Ralph Edward Krenzin, Ph.D., Field Crops.
Joe Kubota, Ph.D., Soil Science.
Robert Consay Lamb, Ph.D., Pomology, Geneva.
Robert John Lambert, M.S., Freehand Drawing.
James Edward Lawrence, M.S., Communication Arts.
John William Layer, M.S., Agricultural Engineering.
Fred George Lechner, D.Ed., Agricultural Engineering.
Arthur Stuart Lieberman, M.S., Floriculture.
Siegfried Eric Lienk, Ph.D., Entomology, Geneva.
Dean LeRoy Linscott, Ph.D., Field Crops.
James Wendell Lorbeer, Ph.D., Plant Pathology.
Robert Theodore Lorenzen, M.S., Agricultural Engineering.
Robert Francis Lucey, Ph.D., Field Crops.
David Corbin Ludington, Ph.D., Agricultural Engineering.
Russell Earl MacDonald, Ph.D., Bacteriology.
Guilford LeRoy Mack, Ph.D., Chemistry, Geneva.
Russell Dickinson Martin, M.S., Communication Arts.
Gerald Alvin Marx, Ph.D., Vegetable Crops, Geneva.
Louis Melville Massey, Jr., Ph.D., Biochemistry, Geneva.
Howard W. Matott, M.S., Cooperative Extension and Extension Leader.
Leonard Robert Mattick, Ph.D., Food Science, Geneva.
William Norman McFarland, Ph.D., Zoology, and Chairman in the Section of Ecology and Systematics.

Alexander Millar Meek, Ph.D., Animal Science.
William George Merrill, Ph.D., Animal Science. Assistant Director of Research and Assistant Director of the Cornell University Agricultural Experiment Station.
Roy Leonard Millar, Ph.D., Plant Pathology.
Jason Millman, Ph.D., Research Methodology.
Robert Rising Morrow, Jr., Ph.D., Forestry.
Roger Alfred Morse, Ph.D., Apiculture.
Robert Glenn Mower, Ph.D., Ornamental Horticulture.
Arthur Leslie Neal, Ph.D., Biochemistry.
Malden Charles Neshiem, Ph.D., Animal Nutrition.
Gene Herman Oberly, Ph.D., Pomology.
Ray Thurmond Oglesby, Ph.D., Aquatic Sciences.
Charles Evans Ostrander, M.S., Poultry Science.
Daniel Ivan Padberg, Ph.D., Marketing.
William Durley Pardee, Ph.D., Plant Breeding and Crop Science.
LaVerne LeRoy Pechuman, Ph.D., Entomology and Curator of Insects.
Nathan Hiram Peck, Ph.D., Vegetable Crops, Geneva.
Arthur Morton Phillips, Jr., Ph.D., Fishery Biology.
Ellis Andine Pierce, Ph.D., Animal Science.
Thomas Theobald Poleman, Jr., Ph.D., Agricultural Economics, and Chairman, African Studies Committee.
Wilson Gideon Pond, Ph.D., Animal Science.
Norman N. Potter, Ph.D., Food Science.
Loyd Earl Powell, Jr., Ph.D., Pomology.
Edgar Merrow Raffensperger, Ph.D., Economic Entomology.
Gerald Edwin Rehkugler, Ph.D., Agricultural Engineering.
Richard Edward Ripple, Ph.D., Psychological Foundations.
Charles Clyde Russell, Ph.D., Communication Arts.
Richard Warren Robinson, Ph.D., Vegetable Crops, Geneva.
Roger France Sandsted, Ph.D., Vegetable Crops.
Robert John Scannell, M.L.A., Ornamental Horticulture.
George Albert Schaefers, Ph.D., Entomology, Geneva.
Edward Arthur Schano, M.S., Poultry Science.
Ernest Frederick Schaufler, M.S.A., Ornamental Horticulture.
Glen Henry Schmidt, Ph.D., Animal Science.
Otto Ernst Schultz, Ph.D., Plant Pathology.
Bernice Margaret Scott, M.A., Rural Sociology.
Norman Roy Scott, Ph.D., Agricultural Engineering.
Thomas Walter Scott, Ph.D., Soil Science.
Robert Ramsey Seaney, Ph.D., Crop Science and Plant Breeding.
Shayle Robert Searle, Ph.D., Biological Statistics.
Maurie Semel, Ph.D., Entomology.
Stanton Shannon, Ph.D., Vegetable Crops, Geneva.
Raymond Sheldrake, Jr., Ph.D., Vegetable Crops.
Wayne Alfred Sinclair, Ph.D., Plant Pathology.
Daniel Gene Sisler, Ph.D., Agricultural Economics.
Don Frederick Splittstoesser, Ph.D., Bacteriology, Geneva.
Victor Russell Stephen, M.A., Communication Arts.
James Ray Stouffer, Ph.D., Animal Science.

Phyllis Eloise Stout, M.S., Cooperative Extension and Extension Leader.
Harold Barber Sweet, B.S., Cooperative Extension and Extension Representative.
Glen Hanna Thacker, M.S., Poultry Science.
Daniel Quale Thompson, Ph.D., Wildlife Management.
John Fanning Thompson, Ph.D., Botany.
William Goodrich Tomek, Ph.D., Prices.
John Preston Tompkins, Ph.D., Pomology.
Leonard Daniel Topoleski, Ph.D., Vegetable Crops.
Hugh Farrant Travis, Ph.D., Animal Science.
Harold Bradford Tukey, Jr., Ph.D., Ornamental Horticulture.
Charles Harrison Uhl, Ph.D., Botany.
Jerome Paul VanBuren, Ph.D., Biochemistry, Geneva.
Peter John VanSoest, Ph.D., Animal Nutrition.
Ari van Tienhoven, Ph.D., Animal Physiology.
Lloyd Dale VanVleck, Ph.D., Animal Science.
Donald Howard Wallace, Ph.D., Vegetable Crops and Plant Breeding.
Roger Darlington Way, Ph.D., Pomology, Geneva.
Robert Elzworth Wilkinson, Ph.D., Plant Pathology.
Charles Edward Williamson, Ph.D., Plant Pathology.
Ray Wu, Ph.D., Biochemistry.
Frank Wilbur Young, Ph.D., Rural Sociology.
Roger Grierson Young, Ph.D., Insect Biochemistry.
Stanley Arnold Zahler, Ph.D., Microbiology.

Assistant Professors

Terry Edward Acree, Ph.D., Biochemistry, Geneva.
Harrison William Ambrose III, Ph.D., Biology.
Heinrich Arn, Ph.D.. Insecticide Assay, Geneva.
David Martin Bates, Ph.D., Botany in the L. H. Bailey Hortorium.
Shaul Ben-David, Ph.D., Agricultural Economics (Visiting).
Arthur Lee Berkey, Ph.D., Agricultural Education.
Stephen Earl Bloom, Ph.D., Cytogenetics.
John Butts Bourke, Ph.D., Chemistry, Geneva.
Wallace Dale Brown, M.S., Cooperative Extension and Extension Leader.
Harry William Burry, M.F., Forestry.
Joseph Mark Calvo, Ph.D., Biochemistry.
Jeffrey Martin Camhi, Ph.D., Biology.
Joseph Kearns Campbell, M.S., Agricultural Engineering.
Ronald Frederick G. Campbell, Ph.D., Communication Arts.
Clarence Albert Carlson, Jr., Ph.D., Fishery Biology.
Jot David Carpenter, M.L.A., Landscape Architecture.
George Louis Casler, Ph.D., Farm Management.
Pierre Clavel, Ph.D., Rural Sociology.
Royal Donald Colle, Ph.D., Communication Arts.
James Robert Cooke, Ph.D., Agricultural Engineering.
Carl Edward Coppock, Ph.D., Animal Science.

Robert Henry Crawford, Ph.D., Communication Arts.
Leroy Lawrence Creasy, Ph.D., Pomology.
Mrs. Stella Ann Crossley, Ph.D., Neurobiology and Behavior.
James Nelson Cummins, Ph.D., Pomology, Geneva.
Thomas Edward Devine, Ph.D., Plant Breeding.
Alexander Dickson, M.S., Forestry.
Michael Hugh Dickson, Ph.D., Vegetable Crops, Geneva.
Donald Leonard Downing, Ph.D., Food Processing, Geneva.
William Bryant Duke, Ph.D., Crop Science.
Paul Robert Eberts, Ph.D., Rural Sociology.
Mrs. Joan Roos Egner, Ed.D., Education Administration.
George Campbell Eickwort, Ph.D., Morphology.
Leonard William Feddema, Ph.D., Personnel Administration.
Paul Patrick Feeny, Ph.D., Entomology.
Gerald Ralph Fink, Ph.D., Genetics.
Bart John Fiori, Ph.D., Entomology, Geneva.
John Latimer Forney, Ph.D., Fishery Biology.
Daniel Dale Fritton, Ph.D., Soil Physics.
Mrs. Audrey Jane Gibson, Ph.D., Microbiology, and Acting Chairman in the Section of Microbiology.
John Daniel Gilpatrick, Ph.D., Plant Pathology, Geneva.
George Lawrence Good, Ph.D., Ornamental Horticulture.
Carl Frank Gortzig, M.S., Floriculture.
Emil Jost Haller, Ph.D., Educational Administration.
Dalva Eugene Hedlund, Ph.D., Occupational Psychology and Guidance.
Harold Franklin Hintz, Ph.D., Animal Nutrition.
Lamartine Frain Hood, Ph.D., Food Science.
R. Kenneth Horst, Ph.D., Plant Pathology.
Geza Hrazdina, Ph.D., Biochemistry, Geneva.
David Heuston Hubbell, Ph.D., Soil Microbiology.
Frederick David Judge, Ph.D., Entomology, Geneva.
Robert John Kalter, Ph.D., Resource Economics.
Elizabeth Beach Keller, Ph.D., Biochemistry.
Deane Alwyn Kemper, Ph.D., Communication Arts.
Anwar Ahmad Khan, Ph.D., Seed Physiology, Geneva.
John Edward Kinsella, Ph.D., Food Science.
Warren Willard Knapp, Ph.D., Meteorology.
Ronald John Kuhr, Ph.D., Insect Toxicology.
Richard Allison Ledford, Ph.D., Food Science.
Ross Joseph MacIntyre, Ph.D., Genetics.
Richard N. McCarty, Ph.D., Biochemistry.
George Wilson McConkie, Ph.D., Psychology and Educational Psychology.
Mrs. Lois Fish McGurk, M.S., Cooperative Extension and Extension Program Leader.
Richard Jerome McNeil, Ph.D., Conservation.
Paul Dean Miller, Ph.D., Animal Breeding.
Peter Lee Minotti, Ph.D., Vegetable Crops.
Aaron Nathan Moen, Ph.D., Wildlife Ecology.
Hugh Francis Mulligan, Ph.D., Aquatic Studies.

Roger Paul Natzke, Ph.D., Animal Science.
Ralph Louis Obendorf, Ph.D., Field Crops Science.
Gerald Walter Olson, Ph.D., Soil Science.
Donald Kenneth Ourecky, Ph.D., Pomology, Geneva.
Albert Boyd Pack, Ph.D., Meteorology.
Donald Ray Price, M.S., Agricultural Engineering.
K. Venkatanarasimha Rao, Ph.D., Plant Physiology (Visiting).
William Shaw Reid, Ph.D., Soil Science.
Milo Eugene Richmond, Ph.D., Wildlife Management.
Wendell Lee Roelofs, Ph.D., Chemistry, Geneva.
Richard Bruce Root, Ph.D., Insect Ecology.
John Neil Rutger, Ph.D., Plant Breeding.
Samuel Waybright Sabin, Ph.D., Animal Science.
George Demetrius Saravacos, Sc.D., Food Science, Geneva.
John Walter Sherbon, Ph.D., Food Chemistry.
Lawrence Ira Slobin, Ph.D., Immunochemistry.
Daniel Lester Solomon, Ph.D., Biometry.
Roger Morgan Spanswick, Ph.D., Plant Physiology.
John Richard Stamer, Ph.D., Bacteriology, Geneva.
Peter Leo Steponkus, Ph.D., Ornamental Horticulture.
Jerry Dean Stockdale, Ph.D., Rural Sociology.
Gilbert Saari Stoewsand, Ph.D., Toxicology, Geneva.
Fred Nicholas Swader, Ph.D., Soil Science.
Ronald Duane Szoke, M.S., Education.
Maurice Tauber, Ph.D., Entomology.
Henry Flansburg Tyrrell, Ph.D., Animal Science.
N. Scott Urquhart, Ph.D., Biological Statistics.
Jerry Kazumitsu Uyemoto, Ph.D., Plant Pathology, Geneva.
Dharam Vir Vadehra, Ph.D., Food Science.
Darrell Robert VanCampen, Ph.D., Animal Nutrition.
Ronald Joseph Vogel, Ph.D., Public Administration.
Walter Frederick Wilkens, Ph.D., Food Science, Geneva.
Bruce Tabor Wilkins, Ph.D., Conservation.
Christopher Foster Wilkinson, Ph.D., Insect Toxicology.
Andraej Zarnecki, Ph.D., Animal Breeding (Visiting).

Instructors

Jane Elizabeth Hardy, B.S., Communication Arts.
James Rowland Joiner, Ed.M., Plant Breeding.
Paula Lieberman, M.A., Biochemistry.
Leslie Eugene Small, B.S., Agricultural Geography.
Jerry Leonard Stone, B.S., Botany.
Richard Tsun-Hsiung Wang, M.S., Physics.
Robert Emmett Zollinhofer, B.S., Biology.

Senior Extension Associates

George John Broadwell, M.S.Ed., Extension Leader.
Harold Edison Carley, M.S., Extension Leader.
Roger William Cramer, B.S., Extension Leader.
Charles Frank Dvorak, Jr., M.S., Extension Leader.
Russell Clair Hodnett, M.S., Extension Leader.
Douglas Robinson Pickett, Ph.D., Acting Extension Representative.
Larry Lee Rhonemus, M.S., Extension Leader.
James Sterling Spero, M.S., Extension Leader.

Senior Research Associates

William Foster Dean, Jr., Ph.D., Poultry Science.
Donald James Hall, Ph.D., Ecology and Systematics.
David B. Peakall, Ph.D., Ecology and Systematics.
Oscar Harris Pearson, Ph.D., Vegetable Crops.
Natalie Whitford Uhl, Ph.D., L. H. Bailey Hortorium.
Ruth Cunniff Young, Ph.D., Rural Sociology.

Cornell University

THE NEW YORK STATE COLLEGE OF AGRICULTURE

Cornell University, the land-grant institution for New York State, was chartered by the Legislature in 1865. By the terms of the Land-Grant Act of 1862, teaching in agriculture has been, from the beginning, a regular part of the University program. In 1904 the Legislature of the State of New York established the College of Agriculture as a state institution under the title, "The New York State College of Agriculture at Cornell University," and made an appropriation for the erection of buildings for the College. In 1906 an administration act was passed by the Legislature defining the purpose and activities of the College of Agriculture thus: "The object of said College of Agriculture shall be to improve the agricultural methods of the state; to develop the agricultural resources of the state in the production of crops of all kinds, in the rearing and breeding of livestock, in the manufacture of dairy and other products, in determining better methods of handling and marketing such products, and in other ways; and to increase intelligence and elevate the standards of living in the rural districts. For the attainment of these objects the College is authorized to give instruction in the sciences, arts, and practices relating thereto, in such courses and in such manner as shall best serve the interests of the state; to conduct extension work in disseminating agricultural knowledge throughout the state by means of experiments and demonstrations on farms and gardens, investigations of the economic and social status of agriculture, lectures, publication of bulletins and reports, and in such other ways as may be deemed advisable in the furtherance of the aforesaid objects; to make researches in the physical, chemical, biological, and other problems of agriculture, the application of such investigations to the agriculture of New York, and the publication of the results thereof."

With the creation of the State University of New York in 1948, the College of Agriculture, as one of the four statutory colleges at Cornell University, became an integral part of this new State University. "Created to provide a comprehensive and adequate program of higher edu-

cation," the State University now includes more than fifty educational institutions. The College of Agriculture, functioning in this broad context, offers teaching and research facilities to serve the agricultural needs of the state.

THE COURSES AVAILABLE

The resident instruction in the College of Agriculture is planned for those who desire an education in agriculture and in the sciences most closely related to agriculture. It is organized, for the most part, in a course of four years, or eight terms, leading to the degree of Bachelor of Science. Those who want instruction in a special field may register for one or more terms as special students, provided they are qualified by education and experience to pursue the courses they want to take (see page 32).

Organized curricula for students with special interests include one-year courses for missionaries and for students in food distribution.

A One-Year Special Curriculum has been introduced in the College. This curriculum, which started in September 1967, replaces the two-year course in agriculture. A limited number of special students will be admitted to pursue the curriculum as provisional candidates for the B.S. degree.

Graduate work in the various fields of agriculture is under the jurisdiction of the Graduate School of Cornell University to which questions about admission should be addressed.

Aside from the above, there is regularly a summer school designed especially for teachers, school principals, and superintendents.

There are also one-week and two-week courses with specific purposes.

THE ONE-YEAR SPECIAL CURRICULUM

The One-Year Special Curriculum places major emphasis on preparation for transfer to the four-year course. It is not designed as a terminal curriculum that will provide adequate education for specific vocations. It should meet the needs of students whose academic preparation in high school appears not to have prepared them adequately for initial enrollment in a degree course, but whose indicated academic potential, background of experience, and demonstrated interest augur well for eventual success in college.

To be considered for admission, an applicant must, by the time of anticipated matriculation, (1) have completed a secondary-school course with credit for at least sixteen units, of which four must be in English; (2) have taken the Scholastic Aptitude Test of the College Entrance Examination Board within the year preceding expected matriculation; and (3) have had approximately one year of work experience related to his stated vocational objective. In addition, presentation of three units of high school mathematics ordinarily will be expected. Although not specifically required, science courses provide desirable preparation.

Students may request admission to the degree program under completion of the One-Year Special Curriculum. For consideration, they should have maintained an average of C or better. Upon transfer to the degree program, credit toward the B.S. degree will be granted for courses successfully completed in the one-year curriculum. Students who do not transfer to degree status will be awarded one-year certificates if the required courses in the curriculum have been completed satisfactorily and if at least thirty credit hours have been passed.

For the curriculum see page 40. Candidates for admission should use the official Cornell University admissions application form.

THE FOUR-YEAR COURSE

The four-year course provides an education in science with emphasis upon applications in agriculture. Graduates of the College are found in such a wide variety of occupations and situations, that only a broad and basic education can give many of them the foundation needed in adjusting to the changes and responsibilities that will come their way. While it is literally correct to think of "agriculture" as applying to crop and livestock production on farms, the four-year course is organized and functions in a much broader educational context.

The requirements for a degree, as outlined on page 33, are extremely flexible, with only a few specific courses demanded of all students. The major part of the program for any individual student is chosen from three large groups of courses. This opportunity for election may result in a broad, general program or one in which basic sciences or, to the other extreme, the more applied subjects, are emphasized almost exclusively.

Programs, arranged with the help of a faculty adviser, are available in the following fields:

Agricultural Economics
- Agricultural Business Management and Marketing
- Agricultural Economics
- Farm Finance and Farm Management
- Food Distribution
- Resource Economics

Agricultural Engineering
- Applied
- Professional (See Engineering Announcement)

Agricultural Sciences

Agronomy
- Crop Science
- Field Crops
- Soil Science
- Soils (Including Soil Conservation)

Animal Science
- Animal Genetics (Breeding)
- Animal Nutrition
- Animal Physiology
- Dairy Production
- Livestock Production
- Meat Science

Biological Sciences—Fields of Concentration:
- Animal Physiology and Anatomy
- Behavior
- Biochemistry
- Botany
- Ecology and Evolution
- Genetics and Development
- Microbiology

Communication Arts

Conservation
- Conservation
- Fishery Science
- Forest Science
- Outdoor Recreation
- Wildlife Science

Cooperative Extension

Education
- Conservation Education
- Teaching Agriculture in High School
- Teaching Science in High School

Entomology-Limnology

Floriculture and Ornamental Horticulture
- Floriculture
- Greenhouse Crop Production
- Landscape Architecture
- Landscape Horticulture
- Nursery Crop Production
- Turfgrass Management

Food Science

International Agriculture
- (Students must also complete the requirement for another specialization)

Plant Breeding

Plant Pathology

Pomology
- Fruit Production
- Pomology

Poultry Science
- Poultry Production
- Poultry Science

Rural Sociology

Statistics and Biometry

Vegetable Crops
- Production and Marketing

A student may choose to pursue a program in *General Agriculture* rather than specializing in a specific field. Those considering *Veterinary Medicine* as a career meet *Pre-vet* requirements while specializing in one of the fields of study or in *General Agriculture.*

Students may qualify for programs in combination with other Divisions in the University: College of Veterinary Medicine, College of Engineering, Graduate School of Nutrition, and Graduate School of Business and Public Administration.

EMPLOYMENT OPPORTUNITIES

The employment opportunities described in the paragraphs which follow are in fields of work in which graduates of the College currently are engaged. It would be possible to compile a long list of specific jobs held by graduates; instead, it has seemed more desirable to name only a few broad fields which include these specific jobs. Experience shows that students should not prepare too narrowly, because unforeseen circumstances may have an important bearing on the specific jobs which they accept initially. Preparation appropriate for a broad vocational field will qualify graduates for more than one job opening within that field or even for openings in more than one field.

FARMING. A first responsibility of the College is to the young men who plan to enter farming. A good living at satisfying work and an opportunity to contribute to community life await the graduates with the necessary farm experience and enough capital to operate a desirable farm. These young men take a general course in agriculture, with

emphasis on the type of farming they plan to follow. A general course likewise fills the needs of others who may enter related fields until they have enough capital to buy or rent a farm.

BUSINESS AND INDUSTRY. Leaders in business and industry, particularly in those businesses or industries that market farm products or serve the production needs of farmers, are continually seeking competent young persons with an agricultural college education.

The food industry is concerned with the movement of agricultural products, such as eggs, milk, meat, fruits, and vegetables, through processing plants and distribution channels to the consumer. To perform these varied services requires men and women with diverse kinds of preparation and personal characteristics. For instance, the milk industry provides opportunities in plant and laboratory work for graduates with educational and practical experience in the handling and processing of milk and milk products: in sales, business management, and regulatory jobs for graduates whose education has emphasized marketing and related courses in agricultural economics.

In the fruit and vegetable processing and marketing fields, there are jobs for fieldmen, buyers, raw-products inspectors, laboratory quality control workers, plant managers, wholesale distributors, and retail store managers. Most of these positions are with food processing companies and with retail food chains.

The business of supplying feed for New York livestock and poultry is of major importance. It requires men who know New York agriculture and, more particularly, who know feeds and the feed requirements of the various types of livestock. The production and the delivery of fertilizers, machinery, pesticides, and all other supplies used on our farms require the services of qualified men. They may need to be well-trained scientists, technicians, salesmen, promotional specialists, or plant operators. Some may serve eventually as managers or in other administrative capacities.

All businesses in agriculture require employees with a knowledge of financing, advertising, insurance, and other specialized services. Credit organizations, both private and governmental, advertising concerns, and insurance companies have employed graduates of the College. Farm-loan representatives have been employed by local banks, insurance companies, and the various branches of the Farm Credit Administration. Farm experience and the ability to work with people are valuable assets as qualifications for employment, along with a general education in agriculture, including agricultural economics.

The production and sale of flowers and ornamental shrubs in New York is an important and large business. Many students who specialize in floriculture and ornamental horticulture are sons and daughters of persons in the greenhouse or nursery business. Others who do not have that background but combine practical experience with their college education find satisfactory opportunities upon graduation.

The College does not have a school of journalism, but it offers several courses in oral, written, broadcasting, visual, and international communication as well as in communications theory. Job opportunities

include editorial and staff positions on newspapers, farm papers, and farm magazines. Agricultural college graduates occupy positions as farm program directors and farm news writers for radio and television services in the state colleges throughout the nation. Some graduates have entered the advertising field.

HIGH SCHOOL TEACHING. Two kinds of secondary school teachers are prepared at the College—teachers of agriculture and teachers of science.

There are more than 300 teachers of agriculture in the secondary schools of New York State. The agricultural instruction in high school includes specialized course offerings in agricultural business, agricultural mechanics, conservation and forestry, farm operation and management, and ornamental horticulture. Newly graduated teachers are continually needed to serve new departments being organized in schools and to replace teachers who retire or change to other occupations. Young men who have a vital interest in youth who desire to study agriculture, and an understanding of the importance of agriculture in the total economy will find the teaching of agriculture a challenging and rewarding field of service. Moreover, the experience gained as a teacher provides an excellent background for related positions in the public schools as administrators or counselors; as teachers in post-high-school institutions offering instruction in agriculture; and in agricultural agencies and businesses, including farming.

The high birth rate of the 1940's and the early 1950's and the increasing number of boys and girls who complete high school have created a strong demand with improved salaries for high school teachers in all fields. Because of the need for scientists in industry as well as in education, the demand for science teachers is particularly acute. This demand is certain to become even greater as boys and girls in the lower grades move on into high school. The young man or young woman who has both an interest in and aptitude for science courses and mathematics, as well as a sincere interest in the welfare of young people, will find rewarding experiences in preparing for and later in serving as a teacher of high school science.

RESEARCH AND COLLEGE TEACHING. Research related to agriculture is concerned with adding to the fund of knowledge bearing on the production, processing, or distribution of farm products. It may be of an economic, social, physical, biological, or chemical nature, depending on the particular kind of problem being studied. The majority of those responsible for research have had advanced, specialized study in a graduate school. Graduates of the four-year course in the College who have superior records and a sound background in basic subject matter have the opportunity to pursue graduate study, often with the help of a graduate assistantship or fellowship to defray part of the costs. In recent years, about one-half of the graduates of the College of Agriculture have continued with graduate or professional study. Positions available upon completion of graduate study are both within and outside the agricultural field.

College teaching involves preparation of the same kind as is needed for research. Whether one engages in research or in teaching depends on personal interests and abilities as well as on opportunities available at the time graduate study is completed. In many cases, graduates hold positions which combine teaching and research.

AGRICULTURAL EXTENSION. The term "agricultural extension" refers to the extending of agricultural knowledge in an out-of-school situation. Cooperative extension, as a part of the University, has agricultural extension agents and 4-H extension agents in most counties of the state. College department staff members with extension responsibilities provide leadership for instigating adoption of new knowledge. Cooperative extension, agricultural missionary, and commercial extension opportunities are open to those who are competent in subject matter and in communication.

CONSERVATION. Opportunities in conservation, outdoor recreation, and the management of fish and wildlife are found principally in employment with either the state or federal government. Occasionally, there are openings with museums and private foundations. The preparation in college emphasizes the biological sciences. The work is likely to consist chiefly of survey and research, but in recent years many management and administrative positions have been established. The work is exacting but of great interest to those scientists with a desire to develop and conserve our natural resources and to help the people to understand them.

SOCIAL SERVICES AND RURAL ORGANIZATIONS. Students may elect a social science concentration as applied to agriculture and rural life. Graduates with this kind of education find opportunities with farm organizations, as caseworkers in local public welfare departments, as camp directors and with youth organizations and community centers. Competent persons with specialized preparation in the rural social sciences at the graduate level are in increasing demand to fill community development positions in the United States and abroad; by agricultural business firms for research; by colleges for extension, research and teaching; and by government research and action agencies. The undergraduate concentration in the rural social sciences provides an excellent foundation for later professional study in preparation for the many opportunities with community planning councils and health and welfare councils; for the professional positions in agencies providing health and welfare services; and for the rural ministry.

FOREIGN SERVICE. In recent years, the international aspect of American agricultural activities, interests, and problems has received increased emphasis. In 1963, the New York State College of Agriculture established a program in International Agricultural Development as a part of Cornell University's contribution toward helping other countries in their efforts to improve agricultural production and standards of living. This added a fourth dimension to the three other divisions of the College of Agriculture—resident instruction, research, and extension.

One part of this new division is an undergraduate program in the vital and rewarding area of international agriculture. Graduates of this program will find opportunities with International Voluntary Services, the Peace Corps, and similar organizations. After gaining overseas experience, they may qualify for foreign assignments with agencies of the United States Government, the Food and Agriculture Organization of the United Nations, or one of the foundations. Occasionally, requests are received for graduates to work for governments of foreign countries.

STATE AND FEDERAL CIVIL SERVICE. Several agricultural agencies, both state and federal, employ their personnel from registers established by the New York State Department of Civil Service or the United States Civil Service Commission. Positions with these organizations may be of a research, extension, or administrative nature. To gain a place on Civil Service registers, seniors or graduates take the appropriate examinations which are announced from time to time.

PLACEMENT SERVICES

Placement services for graduating seniors and alumni are on a decentralized but coordinated basis. The University Career, Summer Plans, and Placement Center is available to all students and alumni of the University and is of most value to those students of the College of Agriculture who are seeking positions in business, industry, government, or teaching. It serves all students and alumni of the University who are qualified for and interested in teaching or related positions in elementary and secondary schools and in colleges. College of Agriculture graduates in the fields of science teaching and vocational agriculture teaching may be placed through the Center.

The Office of Resident Instruction of the College provides a service which combines vocational guidance and placement and is available to both students and alumni. Those interested in graduate study are referred to the appropriate departmental offices for further information and assistance. Placement in the Cooperative Extension Service is a function of the personnel officer in 4-H and Agriculture extension.

Students and alumni also learn informally of employment opportunities through individual professors to whom requests may come because of their wide contacts with prospective employers throughout New York State.

DIRECTIONS REGARDING CORRESPONDENCE

For admissions to the freshman class, to a special course, or to advanced standing from other colleges and universities, all communications should be addressed to the Director of Admissions of Cornell University, Edmund Ezra Day Hall.

For admission to graduate work in agriculture and candidacy for

advanced degrees, communications should be addressed to the Dean of the Graduate School, Sage Graduate Center.

The *Announcement of General Information,* which gives details concerning admission, expenses, scholarships, and related subjects, may be obtained by writing to Cornell University Announcements, Edmund Ezra Day Hall. Announcements of the other colleges, schools, and departments of the University may also be obtained by writing that office.

THE APPLICATION FOR ADMISSION

Admission to the College involves more than presenting specified entrance units. In choosing its students, the College considers not only the secondary school record, but also other available indications of success in the curriculum the applicant proposes to undertake. Therefore, the applicant should submit full information regarding his high school record, background, work experience, school and community activities, resources for financing a college education, and the purpose in seeking it. Such information provides a basis for full consideration of the application. Correspondence regarding these matters is welcome. Applicants are not required to come to the College for interviews, but those who wish to do so should write two or three weeks in advance for appointments. Conference hours are 10:00 A.M. until 12 NOON and 2:00 until 4:00 P.M., during the week and 9:00 A.M. until 12 NOON on Saturdays during the school year. The College office is closed on Saturdays during June, July, and August. Requests for Saturday appointments should be avoided if at all possible.

The practice requirements of the College is described on pages 33–36. Prospective students are urged to read these pages carefully. Those who have neither lived on farms nor had considerable practical farm experience, and who desire admission to a field of study for which farm experience is required, are advised to seek employment for at least one full summer on a well-managed family farm before entering college. This experience is not required for registration as a freshman, but for certain freshman courses it is educationally advantageous.

Candidates for admission to the four-year course must be at least sixteen years of age. The academic requirements may be satisfied by presentation of satisfactory scores in the Scholastic Aptitude Tests of the College Entrance Examination Board combined with acceptable secondary school grades which, for residents of New York State, should include scores on Regents examinations.

Admission to the four-year course is possible only in the fall term, except for students who enter with advanced standing. Applications should be filed during the fall term of the senior year in high school, at the Office of the Director of Admissions, Edmund Ezra Day Hall. Applications will be received until February 15 and after that date only if places in the class remain to be filled.

ENTRANCE REQUIREMENTS FOR THE FOUR-YEAR COURSE

The subjects that may be offered for admission to the College of Agriculture are named in the following list; the figures following each subject indicate the value in entrance units and show the maximum and the minimum amount of credit allowed in the subject. A unit represents five recitations a week for one year in a subject. In drawing and industrial arts, 240 hours are required to earn one unit and 120 hours to earn one-half unit.

ENGLISH, 4 YEARS (required of all entering students) 4

FOREIGN LANGUAGES (modern and ancient) 1,2,3,4
(If a foreign language is offered for entrance, it is desirable to present at least two years of study although credit will be granted for a single year of study in not more than two languages.)

MATHEMATICS

Elementary Algebra	1	Plane Geometry	1
Intermediate Algebra	1	Solid Geometry	½
Advanced Algebra	½	Plane Trigonometry	½

Or (for schools following the recommendations of the College Board Commission on Mathematics):
College Preparatory Mathematics .....1, 2, 3, or 4

SCIENCES

Biology	1	Earth Science	½–1
Botany	½–1	Physics	1
Chemistry	1	Zoology	½–1
General Science	1		

(If a unit in biology is offered, a half-unit in botany and a half-unit in zoology may not also be counted.)

SOCIAL STUDIES, including history (each course) ½–1

VOCATIONAL SUBJECTS

Agriculture	1–6	Home Economics	½–2
Bookkeeping	½–1	Industrial Arts	½–1
Drawing	½–1		

ELECTIVES—any high school subject or subjects not already used and acceptable to the University ½–2

For admission to the College of Agriculture, an applicant must have completed a secondary-school course and must offer both A and B as follows:

A. A *minimum* of sixteen units which must include four in English and three in mathematics. Remaining units must be selected from the list above.

B. Scores of the Scholastic Aptitude Test of the College Entrance Examination Board. Transfer applicants are urged to present scores on a test taken within one year prior to the date of anticipated matriculation. They are not required of applicants for adult special registration.

Applicants to the degree course are encouraged to complete College Board Achievement Tests in two of the following: English composition, mathematics, science.

It is strongly recommended that high school students carry enough courses to offer eighteen entrance units and that these include biology, chemistry, physics, and at least three and one-half units in mathematics.

A committee on admissions in the College of Agriculture reviews the credentials of each applicant. In making its decision, the committee considers not only the nature of the subjects offered for admission and the quality of the work done in those subjects, and all available indications of ability for and interest in the work of the course to be undertaken in the College, but also the background, experience, and interests of the applicant.

The total number of women students at Cornell is fixed by the extent of the facilities provided by the University for the housing of women students. Present facilities are such that the number of women admitted each year must be restricted, with the result that competition for admission is especially severe for this group of applicants. First consideration is given to women who are residents of the State of New York since it is from public funds of the state that the College receives a large part of its financial support. A woman applying from outside of the state should therefore present an exceptionally strong record.

Students who wish to major in one of the sciences or to become research workers should offer adequate training in foreign languages.

Health Requirements on Entrance

Each entering student, graduate or undergraduate, is expected to assume personal responsibility for the health requirements adopted by the Board of Trustees of Cornell University. Prospective students should consult the *Announcement of General Information* or the *Announcement of the Graduate School: Biological Sciences*. Permission to register for a new semester will not be granted unless all health requirements pertaining to the previous semester have been fulfilled.

Advanced Placement for Entering Freshmen

Prospective entering freshmen who have taken college-level courses in secondary school have the opportunity to qualify for advanced placement (and often for advanced standing credit) in these areas of study: biological sciences, chemistry, English, history, Latin, literature, mathematics, modern foreign languages, music, and physics.

In general those who wish to be considered for advanced placement or credit should plan to take the appropriate advanced placement examination(s) of the College Entrance Examination Board in May. Some of the departments listed above offer their own examinations at entrance, however, as an alternative or supplementary method of seeking advanced placement or credit.

Admission With Advanced Standing

A student admitted to the College of Agriculture from another college in Cornell University, or from any other institution of collegiate rank, is regarded as having completed the number of terms and hours to which his records entitle him, and receives all the privileges of students who have completed the same number of terms and hours by residence in the College. He must furnish a transcript and certificate of honorable dismissal from the institution from which he transfers. No more than fifteen semester hours of credit are allowed for one semester of work at another institution. To obtain the degree of Bachelor of Science, however, a student must have completed the prescribed subjects in the four-year course and the requisite number of elective hours in agricultural subjects. He must also have been in residence in the College of Agriculture for his past two terms and have completed not less than fifteen hours a term, of which two-thirds at least must be in subjects taught by the staff of the College of Agriculture. Because advanced-standing credit may reduce the number of summers available for farm or other work after admission, these applicants may be held to satisfy a part or all of the practice requirement at entrance, depending upon the number of terms of residence for which they are held.

Credit toward a degree for preparatory school work, beyond that used in satisfying entrance requirements, may be obtained through a satisfactory grade received in an Advanced Placement Test of the College Entrance Examination Board, in each subject.

College Proficiency Examination Program

Anyone wishing to obtain college credit through the College Proficiency Examination Program of the State Education Department should, prior to the taking of examinations, consult the Director of Resident Instruction, Roberts Hall, as to conditions under which credit may be granted. Each application for credit assignment is considered on its own merits of purpose and preparation. The field in which credit is sought must be appropriate to the graduation requirements of the College, and the intent of the applicant must be clearly to use such credit toward meeting these requirements.

Requirements for Admission of Special Students

Opportunity is provided for the admission of students whose needs may not be well met by the organized curricula of the College. Applicants for admission to such special standing must present entrance credentials as other students do, and in addition, they must present a detailed statement of the program they desire to follow. They must show that they have had recent farm experience or other experience qualifying them for

the special work they plan to do, and, unless they meet the regular entrance requirements they must be twenty-one years of age.

Special students are assigned to faculty advisers who help them arrange a course of study which will contribute directly to their vocational objective and not necessarily to the requirements of the degree course. They may not elect more than one-third of their hours in any semester outside of the College of Agriculture. Transfer to the degree course is sometimes possible for those whose record is considerably better than average and who otherwise give evidence of ability to carry advanced work.

Students having a first degree and desiring further undergraduate work may be admitted as special students. The work of such students is ordinarily limited to courses in the College of Agriculture; for work taken outside, tuition is charged at the rate prevailing in the college where the work is done.

REQUIREMENTS FOR THE DEGREE OF BACHELOR OF SCIENCE

The requirements for the degree of Bachelor of Science are residence for eight terms, except for those who make an average of C (2.0 quality points) or above, and, in addition to the prescribed work in physical education (outlined on page 37), the completion of 120 hours of required and elective work, as outlined on page 36.

Freshmen are required to attend, during their first term, a course designed to orient students in the life of the University and specifically to acquaint them with the scope and purpose of the courses of instruction in the College. The course carries one hour of credit.

A student whose first enrollment in the College was in the fall of 1964 or thereafter must pass a written English Proficiency Examination, administered by a faculty committee, in order to qualify for the degree. The examination is given twice during each academic year, usually in December and May.

To be eligible for the degree, the student must maintain an average grade of at least C (1.7 quality points) for the entire course and must have an average of C (1.7 quality points) or above in the last term. The "last term" is that semester or summer session at the end of which the student is to be recommended by the faculty for a degree.

The Practice Requirement

The student practice requirement was established by the Faculty of Agriculture and is administered through the Office of Resident Instruction. Professor S. R. Shapley is directly responsible for its administration. Students or faculty who have questions about the requirement should consult him at the Student Practice Office, Room 16, Roberts Hall.

The requirement, which applies to both men and women students, is

a minimum of thirteen units of practice credit from acceptable experience. If farm experience is required, eight units of this credit must be obtained before registration for the sophomore year, and the entire thirteen units before registration for the senior year.

Students who are permitted to satisfy the practice requirement through work experience in their field of specialization are required to earn their practice credits *after matriculation,* and to have thirteen units of practice credit before registration for the senior year.

Practice credits earned after matriculation, farm or specialization, may be earned at the rate of approximately one credit per full week of work, if the performance by the student in an acceptable work situation is good and he submits the required reports.

In the following specializations, students satisfy the practice requirement by earning thirteen units of credit gained after matriculation from appropriate experience of a professional nature:

Agricultural Economics
- Food Distribution

Agronomy
- Crop Science
- Soil Science

Biological Sciences
- Animal Physiology and Anatomy
- Behavior
- Biochemistry
- Botany
- Ecology and Evolution
- Genetics and Development
- Microbiology

Communication Arts

Conservation
- Conservation
- Fishery Science
- Forest Science
- Outdoor Recreation
- Wildlife Science

Education
- Conservation Education
- Teaching Science in High School

Entomology-Limnology

Food Science

Statistics and Biometry

Students in the following specializations may meet the requirement of thirteen units of practice credit through farm experience or acceptable experience in their respective professional fields, or by a combination of the two. Those enrolled in these fields of study will be held to meet the requirement entirely through farm experience unless the adviser files a Practice Requirement Designation Form, stating the exception, with the offices of the Director of Resident Instruction and of Student Practice.

Agricultural Economics
- Agricultural Business Management and Marketing
- Agricultural Economics
- Farm Finance and Farm Management
- Resource Economics

Agricultural Engineering
- Applied
- Professional

Agricultural Sciences

Agronomy
- Field Crops
- Soils (including Soil Conservation)

Animal Science
- Animal Genetics (Breeding)
- Animal Nutrition
- Animal Physiology
- Dairy Production
- Livestock Production
- Meat Science

Cooperative Extension
- Cooperative Extension Agent (4-H)

Education
Teaching Agriculture in High School

General Agriculture

International Agriculture
(Students must also complete the requirement for another specialization)

Plant Breeding

Plant Pathology

Pomology
Fruit Production
Pomology

Poultry Science
Poultry Production
Poultry Science

Rural Sociology

Vegetable Crops
Production and Marketing

In the following specializations, students are held for twenty-five units of practice credit:

Cooperative Extension (all from farm experience)
Cooperative Extension Agent (Agriculture)

Floriculture and Ornamental Horticulture (all professional experience)
Floriculture
Greenhouse Crop Production
Landscape Architecture
Landscape Horticulture
Nursery Crop Production
Turfgrass Management

The Student Practice Office is responsible for evaluating all *farm* experience, and evaluates the *farm* experience of all students regardless of their field of specialization at the time of matriculation. This is important because a number of students change their field of specialization after matriculation and because it enables the Office of Resident Instruction to continue basic records and to make studies on the work experience backgrounds of students. Factors considered in establishing the entering farm experience credits are (1) desirability of the farm from the standpoint of obtaining good experience; (2) the student's report on his farm experience; (3) reports from the farmer on the student's work; (4) the length of time of the work experiences; (5) the results of a practical farm experience test.

In some fields of specialization, the type of practice required may vary with the qualifications or interests of the individual student. In certain instances, practice of a specific type is expected early in the college career, while in others it is preferred that the experience be delayed until the junior year. Because of these variations, it is desirable for students to discuss with their advisers, as soon as possible, the question of specialization and the practice that will be required. The responsibility for doing this rests with the student. It may be helpful to talk with advisers in several fields, with other available counselors and with members of the Student Practice Office so that decisions will be based on the best information obtainable.

It is recognized that the interests and objectives of students are subject to change. When a change of objective occurs, a student may change

advisers. For the change to become official, the new adviser must submit a Practice Requirement Designation Form to report the new specialization and corresponding practice requirement. If a change comes too late in the college course, it may delay the time for graduation. Every student is obliged to satisfy the practice requirement of the specialization for which he or she is enrolled at the beginning of the senior year.

Practice requirements do not apply to students in the one-year course or to those admitted as adult special students, because they must have met certain experience standards to qualify for admission. Should such students transfer to the degree course, they must meet the appropriate practice requirement.

Members of the faculty and the Student Practice Office will make suggestions and be of whatever assistance they can in connection with locating employment suitable to meet the practice requirement. However, the College assumes no responsibility for assuring the student that such employment will be found and no responsibility for acceptability to the student of particular working or living conditions. Both of these considerations are the ultimate responsibility of the individual student.

Prospective students and students who desire information about any aspect of the practice requirement or wish assistance in finding employment, should write or consult Professor S. R. Shapley, Student Practice Office, Room 16, Roberts Hall, Ithaca, New York 14850. The department concerned sometimes assists in finding employment for the specialized practice.

The Courses Leading to the Degree of Bachelor of Science

Following is an outline of the course requirements for graduation. Required courses given in the College of Arts and Sciences are described in the *Announcement* of that College.

Freshmen Orientation Course ..... 1 hr.
Physical sciences, biological sciences, social sciences, and humanities 45

Group A. Physical sciences. A minimum of twelve hours in at least two subject areas, including six hours of chemistry or physics. Subject areas: Astronomy 201, 202; chemistry; geology; mathematics; Meteorology 201, 202; physics.

Group B. Biological sciences. A minimum of twelve hours in at least two subject areas including six hours of biology or botany and/or zoology. Subject areas: Introductory Biology or Introductory Botany and Zoology; Biological Sciences (each section in parenthesis is a separate subject area): (animal physiology and anatomy) 210, 311, Veterinary Medicine 310; (biochemistry) 231, 431; (botany) 240, 341, 343, 344, 345,

347; (ecology, evolution and systematics) 270, 361, 362, 371; (genetics and development) 280, 281, Animal Science 220; (microbiology) 290, 290a, 290b; Entomology 210, 212, 351; Organic Chemistry; Plant Pathology 301, 309, 401.

Group C. Social sciences and humanities. A minimum of fifteen hours in at least two subject areas, including six hours of freshman humanities. Subjects: American studies; economics; freshman humanities; government; history; comparative literature; modern foreign language; philosophy; psychology or education 110; Rural Sociology 100 or anthropology or sociology; Industrial and Labor Relations 408, 409.

Elective in the College of Agriculture (including any courses listed in this Announcement on pages 48 to 172 with exceptions specifically noted) 54
Electives (either in Agriculture or in any other college in the University) 20

Total 120

Orientation is not required of students entering with one term or more of advanced standing; in such cases, one hour is added to the requirement in electives in the College of Agriculture.

OFFICER EDUCATION. As a land-grant institution chartered under the Morrill Act of 1862, Cornell has offered instruction in military science for more than ninety years. This instruction is provided through the ROTC programs of the three military Departments, Military Science, Naval Science, and Aerospace Studies.

These programs offer a male student the opportunity to earn a commission while he is completing his education, thus enabling him to fulfill his military commitment as an officer rather than through the draft. To obtain a commission in one of the armed services, a student must complete a specified course of study in an ROTC program and must meet certain physical and mental requirements. Upon graduation he receives a commission and serves a required tour of active military service.

Participation in ROTC is voluntary. Interested students may enroll in the fall of the freshman year. For further details, see the *Announcement of Officer Education*.

Credit is allowed for all courses in ROTC toward the 120 hours required for graduation.

PHYSICAL EDUCATION. All undergraduates must complete four terms of work in physical education. Ordinarily, this requirement must be completed in the first two years of residence; postponement is to be allowed only by consent of the University Faculty Committee on Requirements for Graduation. Exemption from this requirement may be made by the Committee when it is recommended by the University

Health Services, or because of unusual conditions of age, residence, or outside responsibility. Students who have been discharged from the armed services may be exempted.

For students entering with advanced standing, the number of terms of physical education required is to be reduced by the number of terms which the student has satisfactorily completed (whether or not physical education was included in his program) in a college of recognized standing.

Material describing the courses offered in physical education will be made available to entering students by the Department of Physical Education.

Bachelor of Science with Distinction

The degree of Bachelor of Science with distinction will be conferred upon those students who, in addition to having completed all of the requirements for the Bachelor of Science degree, shall have done all of their undergraduate work at Cornell University and have cumulative averages of B+ (3.3 quality points) or above; and upon those transfer students who have been in residence for at least two years and have cumulative averages of A (3.7 quality points) or above.

Bachelor of Science with Honors

As of January 1967, an undergraduate Honors program was initiated in the College. Five broad area committees in the plant sciences, animal sciences, social sciences, physical sciences, and biology will serve to guide this program. Each participant carries out independent research under the direction of a faculty member when the student has received written acceptance into the Honors program. Requirements for entering the Honors program include completion of fifty-five semester credit hours, of which at least thirty hours have been at Cornell University, and a cumulative grade point average at the time of entrance into the Honors program of at least 3.0. Exceptions may be made for the thirty hours required at Cornell for transfer students with exceptional qualifications.

Each report on independent research will be reviewed by the Honors Committee having appropriate jurisdiction. The chairman of each Honors Committee will recommend, in writing, to the Office of Resident Instruction those students who are expected to be graduated with Honors. These recommendations must be received before the date on which midterm grades are due in the semester at the end of which the student expects to graduate. Students so recommended will have diplomas ordered for them with the notation "With Honors."

Dean's List

Excellence in scholarship is recognized twice a year by publishing as a Dean's List the names of those students who have completed at least twelve hours of course work, who are in good standing, and whose semester averages in academic courses are B+ (3.3 quality points) or above.

REGISTRATION FOR COURSES

The standard schedule for the freshman year must include the following courses:

Freshman Orientation Course	1
Physical Education	0
Freshman Humanities	6
Biological Sciences 101–102 or 103–104 or 103–106	6
Chemistry or Physics	6
Elective courses in the College of Agriculture	6
Elective courses in the basic sciences, in social sciences and humanities, or in the College of Agriculture	3–6

In making his program, the student has the assistance of a faculty adviser, preferably from the field in which he expects to specialize. The adviser is ordinarily assigned to the new student for the first term, but following that he is chosen by the student. Other counselors to assist students on personal matters, vocational guidance, and placement are available in the Office of Resident Instruction, Roberts 192.

A student must register for at least twelve hours each term, and no new student may register for more than eighteen hours in addition to the regular work in physical education.

Failures in courses, either required or elective, taken outside the College of Agriculture are counted against the allotment of the twenty free hours that may be taken in any college.

Senior students who have met all college requirements and desire to take courses outside the College of Agriculture, in addition to those required or allowed free, may do so upon paying for the additional hours at the rate of tuition prevailing in the colleges in which the courses are taken. Other students are not allowed to exceed, even by paying for the excess hours, the twenty hours of endowed college courses charged to this category unless they have met, or at the same time are meeting, the minimum agricultural elective requirement. Senior students whose cumulative averages place them in the top 15 percent of their class, and who are recommended by the department in which their major work is done may be permitted to elect, without additional payment, up to ten hours in basic science outside the College of Agriculture beyond the twenty hours normally allowed for election in any college.

Courses in Advanced ROTC may be taken, in addition to the twenty hours of free electives outside the College, without payment for those excess hours.

The curriculum for provisional candidates shall include the following:

Physical Education	No Credit
Education 7—Reading and Study Skills	No Credit
Orientation 101	1 hr.
Communications (Instruction in speaking, writing, and literature)	0 to 6 hrs.
Chemistry	5 to 6 hrs.
Mathematics	0 to 6 hrs.
Agricultural Electives	10 to 20 hrs.

The actual courses which will be used to fill the requirements in the communications, chemistry, and mathematics areas will be dependent upon college courses offered in these areas.

COURSES IN AGRICULTURE OPEN TO FRESHMEN

Agricultural Economics 150, 240
Agricultural Engineering 104, 106, 107, 152, 153, 204, 205, 222, 233, 234
Agronomy 111
Animal Science 100, 112, 250, 260, 265
Biological Sciences 101–102, 103–104, 106
Conservation 110, 201
Drawing (freehand) 109–110, 111
Education 110
Entomology 260
Floriculture and Ornamental Horticulture 101, 102
Food Science 100
Meteorology 201
Orientation 1, 5, 7, 101, 110
Pomology 101, 102
Poultry Science 100
Rural Sociology 100
Vegetable Crops 103, 210, 222

COMBINED COURSES

With the College of Engineering

AGRICULTURAL ENGINEERING

A joint program of the Colleges of Agriculture and Engineering at Cornell University leads to the degree of Bachelor of Science at the end of four years. Students in this program register in the College of Agriculture during the first three years but take courses in the Colleges of Engineering, Arts and Sciences, and Agriculture. In the fourth year the registration is in the College of Engineering which recommends the candidates to the Trustees of the University for the degree.

Applicants for admission must meet the academic entrance requirements for the College of Engineering. These are: sixteen units including English, four units; one foreign language, two units; history, two units; elementary and intermediate algebra, two units; plane geometry, one unit; trigonometry, one-half unit; either advanced algebra, one-half unit, or solid geometry, one-half unit; chemistry, one unit, or physics, one unit (preferably both). It is recommended that the candidate offer advanced algebra, if possible, and that at least three of the elective units offered be in further study in language or history. The mathematics courses listed above may be taken as separate courses or may be

included within four units of comprehensive college preparatory mathematics.

Each candidate for admission is required to take the Scholastic Aptitude Test of the College Entrance Examination Board and to request the Board to report the results to the Director of Admissions, Cornell University. Candidates are urged to take the tests in January of their senior year.

Applicants must also take the College Entrance Examination Board achievement tests in advanced mathematics and either physics or chemistry. These tests should be taken not later than March of the year of the applicants' entrance to college.

Since it is the purpose of this curriculum to prepare engineers for a variety of agricultural specializations such as buildings, soil and water management, machinery, manufacturing and processing of agricultural products and supplies, drainage, irrigation, etc., evidence of interest in and background for engineering work in agriculture is a qualification for admission that is given careful consideration.

The curriculum includes basic work in biology, mathematics, physics, and chemistry; a well-rounded selection of courses in engineering science and technology, including agricultural engineering; courses in soils, crops, farm management, and other subjects in agriculture; and general studies to provide a broad and useful training.

Charges for tuition and fees, during the first three years in the curriculum, are the same as outlined on page 43, except that students in this combined course are required to take more courses outside the College of Agriculture than are permitted to other students, for which they must pay, on a credit-hour basis, as soon as the regular allowance has been used up. The amount of the charge depends upon the specific courses that are taken but is approximately a total of $1,000 for the first three years. Payment for the excess hours begins in the second year, but the major part is paid in the third year. In the fourth year these students are subject to the tuition and General Fee charged in the College of Engineering, which at present totals approximately $1,100 each term.

Students in the agricultural engineering curriculum must satisfy the practice requirement, as described on pages 33–36 of this *Announcement*.

In applying for admission the applicant should indicate in the application, which should be sent to the Director of Admissions, that he wants to enter the College of Agriculture for agricultural engineering.

The amount, time, and manner of payment of tuition, fees, or other charges may be changed by the Board of Trustees at any time without notice.

With Business and Public Administration

Properly qualified students of the College of Agriculture may, during their third year, apply for admission to a joint program between the College of Agriculture and the Graduate School of Business and Public Administration. Under this program, the student who is admitted may

complete the requirements for the Bachelor of Science degree for the College of Agriculture at the end of his fourth year and for the degree of Master of Business Administration or degree of Master of Public Administration at the end of his fifth year. The student in this program must successfully complete a minimum of thirty hours of course work in the Graduate School of Business and Public Administration during the fifth year.

A careful selection of courses is necessary if the two degrees are to be earned in five years; therefore, a student who is interested should plan his program with the help of the designated faculty adviser, beginning with the sophomore year. If the decision to apply is not made until later, consultation with the adviser is necessary to determine whether the requirements for the two degrees can be met in five years or if a longer time is needed.

The opportunity to receive these two degrees in five years, when the normal time is six years, is made possible by the inclusion in the fourth-year schedule of certain courses from the Department of Agricultural Economics that may be acceptable in lieu of certain first-year requirements by the Graduate School of Business and Public Administration. Similarly, the faculty of Agriculture accepts up to nine hours of courses in Business and Public Administration in the fourth year toward the satisfaction of the requirement in the social studies. These substitutions are allowed only to those who have been accepted for admission by the Graduate School of Business and Public Administration and who have their schedules approved by the College of Agriculture faculty adviser for this program.

In the fifth year the student registers only in the Graduate School of Business and Public Administration. The program of that year includes the remaining core subjects required of all students in Business and Public Administration, together with elective courses. The specific courses to be taken depend upon the career interests of the student and are determined in consultation with his adviser. At the beginning of this fifth year the student will select a concentration from such areas as: industrial accounting, professional accounting, finance, international business operations, managerial economics, marketing, personnel management, production and operations management, quantitative analysis for managerial decision making, transportation, organizational theory and behavior, and agricultural management. Options within the agricultural management area include: management of farm cooperatives, agricultural credit administration, agricultural industries, agricultural marketing, public policy and the administration of government agricultural programs, and management of natural resources.

During the first four years these students are subject to the tuition requirements of the College of Agriculture and in the fifth year to those of the Graduate School of Business and Public Administration.

For further details about this joint program and its admissions requirements reference should be made to the *Announcement of the Graduate School of Business and Public Administration.*

The College of Agriculture and the Graduate School of Business and Public Administration also cooperate in a special program in food dis-

tribution. This joint effort carries the sponsorship of the National Association of Food Chains. The majority of the students have been employed in the food distribution industry, but the program also attracts others. Qualified degree holders may enroll in the Graduate School as candidates for the Master of Science or Doctor of Philosophy degree, or in the Graduate School of Business and Public Administration as candidates for the Master of Business Administration degree (which requires two years of residence). Undergraduates register in the College of Agriculture as candidates for the Bachelor of Science degree. Others who are not interested in a degree enroll as special students in the College of Agriculture and are granted a certificate at the successful completion of one year of work.

With the School of Nutrition

A plan of the College of Agriculture and the Graduate School of Nutrition permits students of Agriculture, who qualify, to follow a curriculum that leads to the regular degree of the College of Agriculture at the end of the fourth year, and the degree of Master of Nutritional Science or Master of Food Science at the end of the fifth year. To meet the requirements for the two degrees in five years, instead of the normal time of six years, the student in Agriculture should start planning his program with his adviser for students of nutrition not later than the end of the freshman year. During the first four years of this program, students are subject to the tuition requirements of the College of Agriculture and in the fifth year to those of the School of Nutrition.

With the Veterinary College

Students who do their preveterinary work in the College of Agriculture and are accepted by the Veterinary College at Cornell University sometimes qualify for degrees from both colleges. This takes about seven years and is ordinarily done by spending the first three years in Agriculture followed by four in the Veterinary College, including a combined registration in Agriculture during the semester in which the requirements for the B.S. degree are completed. The candidate must petition for combined registration prior to the beginning of the semester in which he qualifies for the degree.

PAYMENTS TO THE UNIVERSITY

TUITION

Tuition is $200 per term for undergraduate and special students registered in the New York State College of Agriculture who are and have been bona fide residents of the State of New York for at least twelve

months immediately prior to the registration day of each term of the academic year.

Tuition is $300 per term for students who do not qualify as New York State residents.

Since physical presence in the State, especially for persons under age, by no means constitutes legal residence, applicants who are at all doubtful of their right to qualify as New York State residents should address inquiries to the Director of Resident Instruction in the College of Agriculture.

Students transferring from the College of Agriculture to other colleges in the University must first make payment for the difference in tuition for the credit transferred.

Students desiring to take, while registered in the College of Agriculture, courses in other colleges in the University beyond those specifically required and also beyond the twenty hours allowed free may do so upon payment of tuition for the additional hours at the rate of tuition in the college in which the work is taken.

The University Treasurer mails the student a statement of tuition and fees prior to the beginning of each term. The charges are payable before registration in the University.

Any student, graduate or undergraduate, who fails to pay his tuition, fees, and other indebtedness within the time prescribed by the University is thereby dropped from the University. A reinstatement fee of $10.00 is assessed in case of default in payments. For reasons satisfactory to the Treasurer and the Registrar, which must be presented in writing, the above assessment may be waived in any individual case.

If the student withdraws, tuition and fees are charged at the rate of 10 percent for each week or fraction thereof in attendance.

The amount, time, and manner of payment of tuition, fees, or other charges may be changed by the Board of Trustees at any time without notice.

FEES AND INSTRUCTIONAL EXPENSES

A DEPOSIT OF $50.00 must be paid after the applicant has received notice of provisional acceptance. At the time of the first registration in the University, the deposit is used to cover matriculation charges, provides for certain graduation expenses, and establishes a fund for undergraduate and alumni class activities. The deposit is not refundable.

A DEPOSIT OF $30.00 is required for a uniform, payable at registration in the first term, for students who enroll in the basic course in military science. Most of this deposit is returned as earned uniform allowance upon completion of the basic course.

A GENERAL FEE OF $175 for New York State residents, and $275 for nonresidents, is required at the beginning of each term. This fee and the tuition cover the following services: (1) *health services and medical care* (see page 188). (2) *Willard Straight Hall membership.*

Willard Straight Hall is the student union; each student shares in the common privileges afforded by the operation of Willard Straight Hall, subject to regulations approved by the Board of Managers of the Hall. (3) *Laboratory services* for courses taken in the state colleges. (4) *University administration and endowed college laboratory services.* (5) *Physical recreation.* Each male student is entitled to the use of the gymnasium and the University playgrounds, and to the use of a locker, showers, and towels in Teagle Hall, Barton Hall, or the Schoellkopf Memorial Building; and each woman student to the use of the facilities in Helen Newman Hall, the women's physical education and sports building. (6) *Student activities.* The fee helps to provide funds for worthy student organizations as approved by the Board of Trustees on recommendation of the executive board of the Cornell student government.

BOOKS, instruments, and instructional supplies may cost from $25.00 to $50.00 a term.

MISCELLANEOUS RULES AND ASSESSMENTS

Every student is held personally responsible for any injury done by him to any of the University's property.

Assessments, charged to the student's account and payable at the Treasurer's office, are levied upon the student in certain circumstances, under the following rules of the University: (1) A matriculated student desiring to register after the close of registration day must first pay a fee of $10.00 (2) A student desiring to take an examination or other test for the completion of a course in which the grade "incomplete" was reported must first pay a fee of $2.00 for each examination or other test.

For reasons satisfactory to the proper authority, any of the above-mentioned assessments may be waived in any individual case if the student's failure to comply with the regulation was due to ill health or to any other reason beyond his control. Application for such a waiver should be made to the Secretary of the College.

STUDENT HOUSING AND DINING

UNDERGRADUATE STUDENTS

MEN. Cornell University provides on the campus, dormitory facilities for about 2,100 men. Complete cafeteria and dining service is provided in Willard Straight Hall, Noyes Lodge, Noyes Center, Martha Van Rensselaer Cafeteria, Hughes Hall Dining and Sage Cafeteria (graduate students), and Stocking Hall (Dairy Bar) Cafeteria. In the fall of 1967, the Agnes and Jansen Noyes Center was completed. This center, located in the men's residential area, contains dining services, lounges, activity rooms, study areas, typing and music rooms. Application forms for

dormitory accommodations will be mailed to each male candidate for admission as a freshman or a transfer student at the time of notification of provisional acceptance to the University.

Except as indicated below, all freshmen men are required under University policy to live and take their meals within the University dining halls for two terms. The exceptions for freshmen men are:

1. Men twenty-one years of age or older,
2. Men living with their parents or relatives,
3. Married men.

Freshmen in the above categories should write to the Office of the Dean of Students, Room 133, Edmund Ezra Day Hall, to request exemption from the residence requirements. Permission for any other freshmen to be exempt from the residence requirement should also be made in writing to the Office of the Dean of Students.

Off-campus housing is available in apartment buildings, in private homes and in rooming houses. The University, as a service to students, maintains a listing of available rooms and apartments. Inquiries should be addressed to the Off-Campus Housing Office, Day Hall.

WOMEN. The University provides dormitories for the housing of undergraduate and graduate women. These residence units are supplemented by sorority houses in areas close to the dormitories. With few exceptions all undergraduate women students are required, under University policy, to live and take their meals in a University residence unit or in a sorority house (for members only). Permission to live elsewhere in Ithaca is granted only under exceptional circumstances upon written application to the Office of the Dean of Students, Day Hall.

An application form for living accommodations for undergraduate women will be sent with the notice of provisional acceptance from the Office of Admissions to each candidate.

Graduate women should make application for University dormitory housing directly to the Department of Housing and Dining Services.

MARRIED STUDENTS

The University, through the Department of Housing and Dining Services, maintains apartment accommodations for some of its married students and their families. These are Cornell Quarters, Pleasant Grove Apartments, and Hasbrouck Apartments, with total housing for about 400 families. All apartments are unfurnished. For further information and application, write the Department of Housing and Dining Services, Day Hall.

The Department of Housing and Dining Services also maintains a list of available rental housing in the Ithaca area. Information on housing currently available can be obtained only at the Off-Campus Housing Office in Day Hall. Lists cannot be sent out as changes occur daily.

GRADUATE STUDENTS

University dormitory housing is available to single graduate students upon application to the Department of Housing and Dining Services, Day Hall. Married graduate students may apply to the Manager of Housing, Department of Housing and Dining Services, for University-operated housing. Applications for all University housing should be made as soon as possible after January 1 for all fall matriculants; after October 1 for spring matriculants. Detailed information concerning University housing may be obtained by writing to the Department of Housing and Dining Services.

Sage Hall, the graduate center, provides dormitory housing for approximately 200 men and women. Situated in the center of the campus, it is convenient to all colleges. There is a cafeteria in the building.

Cascadilla Hall, located at the southwest entrance to the Campus, is a graduate dormitory for men housing 160 students.

Rooms and apartments adjacent to the campus or in the downtown area are available in limited number. Students desiring off-campus housing should arrange to come to Ithaca well in advance of the term opening to arrange such accommodations. Inquiries may be directed to the Office of Off-Campus Housing, Day Hall.

DEPARTMENTS OF INSTRUCTION

With Outlines of Courses That May Be Chosen by Regular or Special Students as Agricultural Electives

Special notice. Unless otherwise noted, all courses are given in the buildings of the College of Agriculture. Courses enclosed in brackets will not be given in 1969–70.

Courses numbered 100 through 199 are introductory courses primarily for freshmen and sophomores; courses numbered 200 through 299 are intermediate courses primarily for underclassmen; courses numbered 300 through 399 are advanced courses primarily for juniors and seniors; courses numbered 400 through 499 are primarily for seniors and graduate students; courses numbered 500 through 599 are primarily for graduate students; and courses numbered 600 through 699 are seminar courses.

Grades A–F are used in the College. Also, S (Satisfactory) and U (Unsatisfactory) grades are given in courses where specified. College legislation restricts the use of S-U grades to upperclassmen who may receive one S-U grade per semester. Courses designated for S-U grade may not be in the student's specialization, nor may they be used to satisfy specific course and distribution requirements.

ORIENTATION

1. ENGLISH TUTORIAL (S and U exclusive)

Fall or spring term. No credit. Required of juniors who have not met the English Proficiency Requirement of the College. Open to sophomores and selected freshmen on advice of their faculty adviser. M W F 11:15, 12:20, Warren 101, or 1:25, Warren 201 (fall), Warren 145 (spring).

Group tutorial course to help students write correct and effective English. Writing an acceptable composition at the time of the English Proficiency Examination will constitute successful completion of this course.

5. ORIENTATION

Fall or spring term. Credit three hours. The credit is not counted toward the 120 hours required for the degree. Fall term: For entering students only. M W F 8 or 9:05, or T Th S 8 or 9:05. Warren 160. Spring term: May be elected by first-year students only. M W F 12:20. Warren 232. Professor to be appointed.

Emphasis on the analysis and reasoning involved in the solution of verbal problems which have been drawn mainly from College of Agriculture courses requiring the use of mathematics.

7. COLLEGE READING AND STUDY SKILLS PROGRAM (S AND U exclusive)

Twice each term. Non-credit. Program 1 starts at the beginning of fall term; Program 2 directly after Thanksgiving recess; Program 3 at beginning of

spring term; and Program 4 directly after spring recess. The initial fall program is reserved for freshmen. The other three programs are open to all registered students. Registration takes place in Room 304. Olin Hall, during the insession week preceding the beginning of each program. Mr. Pauk.

Principles and techniques for reading and studying more effectively are explained, demonstrated, and practiced in class. The reading laboratory provides an opportunity for increasing one's rate of reading.

101. ORIENTATION

Fall term. Credit one hour. Required of all freshmen in Agriculture. One lecture-discussion period a week. To be arranged. Professors Hertel and Tyler, and Mr. Spencer.

110. INTRODUCTORY COLLEGE MATHEMATICS

Fall or spring term. Credit four hours. T Th S 8, M W F 8, 12:20. Laboratory, T or Th 12:20. Warren 231. Associate Professor Geiselmann.

Designed to give students with a sound high school mathematics background a unified treatment of the basic concepts of college algebra, trigonometry, analytic geometry, and the elements of calculus. Considerable emphasis will be placed upon the concept of function, graphing, problem solving, and methods of proof. The Cornell University Computing Language, (CUPL), will be taught and used to strengthen and integrate the mathematical topics covered in the course.

AGRICULTURAL ECONOMICS

The Department offers courses covering a wide range of subjects. Undergraduates interested in this field may specialize in agricultural business management and marketing, agricultural economics, farm management and farm finance, food distribution, international agriculture, or resource economics. Course programs arranged with the help of faculty advisers may lead to employment on farms or in related industries or in public agencies serving agriculture in the United States or abroad, or prepare the student for advanced work beyond the B.S. degree.

Specialization in this Department may enable qualified students to enter the combined program with the Graduate School of Business and Public Administration leading to the M.B.A. or M.P.A. degree at the end of the fifth year. Undergraduates meeting college requirements may participate in the Honors program in the social sciences under the direction of a faculty member.

Farm Management

302. FARM MANAGEMENT

Spring term. Credit five hours. Lectures, M W F 10:10. Warren 145. Laboratory: W Th or F 1:25–4:25. Warren 101. On days when farms are visited, the laboratory period is 1:25–5:30. Professor Warren.

A study of the organization and operation of the farm from the point of view of efficiency and continuous profit; farm records, farm business analysis, factors affecting profits, size of business, choice of enterprises, partnership arrangements, getting started in farming, planning the organization and management of specific farms. One all-day trip and four half-day trips are taken to visit farms in near-by regions.

402. FARM MANAGEMENT

Spring term. Credit three hours. Prerequisite, Course 302, or its equivalent. Lecture, W 10:10. Laboratory, W 1:25–4:25. Warren 201. On days when farms are visited, the laboratory period is 1:25–5:30. Professor to be appointed.

Study of the organization and operation of major types of farms in different regions of New York State. Visits to farms and analysis of operations are made to show the application of farm management principles.

403. FARM COST ACCOUNTING

Fall term. Credit three hours. Prerequisite, Course 302. Lectures, M W 10:10. Laboratory, W 2:30–4:25. Warren 160. Brief weekly conferences to be arranged. Professor Kearl.

Cost-accounting methods and procedures as applied to farms. Topics considered are the organization of accounts, methods of cost determination and allocation, summarization and analysis of accounts, making financial and operating statements, and studying the farm business.

405. FARM FINANCE

Spring term. Credit three hours. Prerequisite, Course 302. Lectures, T Th 10:10. Discussion, T 1:25–4:25. Warren 145. Professor Smith.

A study of sound financial arrangements for farmers and the credit institutions which serve them. Emphasis is placed on problems of capital management associated with organizing and operating a commercial farm. Alternative sources of capital are analyzed and consideration given to safe and profitable debt levels and selection of alternative investment opportunities. Insurance programs, family financial planning, and retirement and estate planning for farmers are also studied.

406. FARM APPRAISAL

Fall term. Credit three hours. Prerequisite, Course 302. Lecture, T 10:10. Laboratory, T 1:25–4:25. Warren 101. On days when farms are visited, laboratory period is 1:25–5:30. Professor Warren.

A study of factors governing the price of farms, methods of farm valuation, and practice in the appraisal of farms.

408. PRODUCTION ECONOMICS

Spring term. Credit three hours. Prerequisites, Economics 101–102. Lectures, M F 10:10. Warren 160. Discussion, M 1:25–3:20. Warren 160. Assistant Professor Casler.

An application of economic principles to problems of production. Topics covered include production functions, cost curves, linear programming, risk and uncertainty as they apply to farm and business firms.

500. THE BUSINESS OF FARMING

Fall term. Credit three hours. For graduate students who are interested in becoming better acquainted with modern farm businesses. Lecture, W 10:10. Laboratory and field trips, W 1:25–5:30. Warren 101. Professor Warren.

A study of the organization and operation of farms from the point of view of efficiency and continuous profit. Factors affecting profits, the effects of changing technology; capital and labor requirements; methods of financing; use of credit. Visits to representative farms and study of their businesses.

507. FARM MANAGEMENT RESEARCH METHODS

Fall term. Credit two hours. Open only to graduate students. F 1:25–3:20. Warren 260. Professor Stanton.

A discussion of problems and methods used in doing research. Emphasis is placed on the organization of research projects, sources and methods of obtaining data, sampling, and the different methods of analyzing data commonly used by research workers in this field.

508. QUANTITATIVE METHODS IN PRODUCTION ECONOMICS

Fall term. Credit three hours. Open only to graduate students. Lectures, M W F 11:15. Warren 160. Professor Robinson.

A review of economic theory and quantitative techniques applicable to resource allocation problems in agriculture. Topics discussed include fitting production functions, deriving and interpreting coefficients obtained from interindustry studies, and the use of linear programming techniques to determine optimum product or least-cost input combinations.

Agricultural Policy, Prices and Statistics

Attention is directed to courses in mathematics and statistics in the Departments of Mathematics, Industrial Engineering and Operations Research, Economic and Social Statistics (I.L.R.), and Plant Breeding.

314. INTRODUCTORY STATISTICS

Fall term. Credit three hours. Lectures, T Th 11:15. Warren 45. Discussion, M W or Th 1:25. Warren 145. Computing period of one hour to be arranged in the afternoon or morning following the discussion section, M W or Th 2:30, or T 10:10 or W 3:35 or F 11:15. Warren 360. Professor to be appointed.

An introduction to procedures and methods of analysis used in the study of agricultural and economic data. Frequency distributions, measures of central tendency and dispersion, index numbers, time series analysis, simple regression and correlation, point and interval estimation, and tests of hypotheses are covered.

315. PRICES

Spring term. Credit three hours. Prerequisites, Economics 101–102 and Course 314. Lectures, T Th 10:10 and W 12:20. Warren 160. Associate Professor Tomek.

A course in applied price theory and elementary quantitative methods emphasizing the study of agricultural commodity prices. Topics include economic models of temporal and spatial price variation. The price analysis section involves the application and extension of the methods of Course 314, including the use of multiple linear regression in estimating economic relationships. The transportation problem of linear programming is introduced as a part of the discussion of spatial price equilibrium models.

351. AGRICULTURAL POLICY (S and U optional)

Fall term. Credit three hours. Two lectures plus one discussion section each week. Lectures, T Th 9:05. Warren 45. Discussion sections, Th 11:15 or 2:30, or F 10:10. Warren 260. Professor Robinson.

A review of the history of public policies affecting agriculture in the United States and an analysis of the economic effects of alternative farm policies or programs, either proposed or adopted. Among the topics discussed are farm price support and surplus disposal programs, trade policies affecting agriculture and farm politics.

515. APPLIED ECONOMETRICS IN AGRICULTURAL ECONOMICS

Spring term. Credit three hours. Prerequisite, preparation in economics and statistics at the level of Economics 311–312 and I. & L.R. 311. T Th 1:25–2:45. Plant Science 143. Associate Professor Tomek.

A course in econometrics, emphasizing applications, taught at about the level of *Econometric Methods* by J. Johnston.

651. SEMINAR IN AGRICULTURAL POLICY (S and U optional)

Spring term. Credit two hours. Open only to graduate students. W 2:30–4:25. Warren 245. Professor Robinson.

A discussion of agricultural trade, price, and income-support policies in the United States and selected foreign countries and techniques appropriate to the analysis of policy issues.

Business Management

Attention is directed to courses in economics and mathematics in the College of Arts and Sciences and in administration in the Schools of Hotel Administration, Business and Public Administration, and Industrial and Labor Relations.

221. ACCOUNTING

Fall term. Credit three hours. Lectures, M F 10:10. Warren 45. Laboratory, T or Th 8–9:55; M T W or Th 2:30–4:25. Warren 201. Professor to be appointed.

A comprehensive survey of basic accounting principles. Some analysis and interpretations of financial statements with special emphasis on agricultural business.

222. ACCOUNTING

Spring term. Credit three hours. Prerequisite, Course 221 or its equivalent. Lectures, T Th 11:15. Warren 45. Laboratory, W 12:20–2:15, T or W 2:30–4:25. Warren 260. Associate Professor Goodrich.

Consideration of concepts and techniques for accumulating, modifying, and analyzing basic accounting data essential in the control of a business. Includes topics such as: bond issuance; cost account systems; tax, inventory, depreciation, and price level problems affecting income determination; financial statement analysis; preparation and significance of budgets and other special accounting reports.

320. BUSINESS LAW

Fall term. Credit three hours. Lectures, M W F 9:05. Plant Science 233. Limited to upperclassmen. Associate Professor Bugliari.

Consideration is given chiefly to legal problems of particular interest to persons who expect to engage in business, with emphasis on the fields of personal property, contracts, agency, real property, partnerships and corporations.

321. ADVANCED BUSINESS LAW

Spring term. Credit three hours. Lectures, T Th 8–9:55. Warren 45. Prerequisite, Course 320 or its equivalent. Associate Professor Bugliari.

Designed for those students who plan business careers in which a more detailed and comprehensive legal background could be utilized. Selected areas covered in Course 320 will be further developed and particular con-

sideration will be given to the law pertaining to bailments, sales, secured transactions, bankruptcy, negotiable instruments, insurance, and trusts and estates.

326. FARMERS' COOPERATIVES

Spring term. Credit three hours. Lectures, M W F 9:05. Warren 145. Professor Hedlund.

What cooperatives are, what they have tried to do, and what they have done; their legal status and special problems of organization, finance, and control.

327. BUSINESS ORGANIZATION AND MANAGEMENT

Fall term. Credit three hours. Limited to upperclassmen. Lectures, T Th 10:10. Bradfield 101. Discussion, T or Th 2:30–4:25. Warren 160. Associate Professor Brown.

An introductory course on how business activities are organized and managed. Lectures are devoted to a description and analysis of the structure of business activity, external forces affecting business activity, financing business operations and managing business firms. Discussion periods are used to discuss important current issues and the application of management principles. A stock investment project provides an opportunity to study the stock market and the investment potential of common stocks.

328. ECONOMICS OF MANAGERIAL DECISIONS

Spring term. Credit three hours. Prerequisites, Economics 102 and Course 221 or their equivalents. Lectures, M W F 9:05. Warren 45. Discussion, W 2:30–4:25 (Warren 160); Th 8–9:55, 10:10–12:05 (Warren 201); Th 12:20–2:15 (Warren 31); F 9:05–11 or 12:20–2:15 (Warren 201). In weeks when discussions are held, there will be no Friday lecture. Associate Professor Aplin.

Emphasis is placed on identifying problems in a business, recognizing alternatives, and using economic data as guides to making decisions. Principal topics considered include cost analysis, with emphasis on identifying costs relevant for various decisions within the firm; pricing policies of firms; planning capital investments and sales forecasting. Class discussion is supplemented by case studies to illustrate concepts and techniques available to management to assist them in making sound decisions.

425. PERSONAL FINANCIAL MANAGEMENT

Spring term. Credit one hour. Primarily for seniors. Lecture, F 12:20. Warren 45. Three evening discussion sessions during the term to be arranged. Professor R. S. Smith and Associate Professor E. H. Brown.

Identification and analysis of problems in personal financial management common to young families. A study of income flows into the budget and financial demands on family resources. Personal income and budgeting, consumer credit, asset acquisition, personal insurance programs, savings and investments, basic elements of retirement and estate planning.

626. SEMINAR IN AGRICULTURAL COOPERATION

Spring term. Credit two hours. Open only to graduate students. Time and place to be arranged. Professor Hedlund.

A discussion of the economic theory and function of farmer cooperatives. The place and contribution of cooperatives in developing and developed economies will be considered along with problems of structure, finance, management, and control.

Public Administration and Finance

Attention is directed to course offerings in the Departments of Economics, Government, Sociology, and Anthropology in the College of Arts and Sciences and to courses in administration and finance in the School of Business and Public Administration.

330. LOCAL GOVERNMENT (S and U optional)

Fall term. Credit three hours. Lectures, T Th 9:05. Warren 145. Discussion period, T or Th 2:30–4:25. Warren 31. Professor Lutz.

Government in the United States with emphasis upon examination, analysis, and resolution of public issues confronting leadership in areas of New York. Government organization, administration, functions, and finance are discussed in this context.

338. TAXATION (S and U optional)

Fall term. Credit three hours. Lectures, M W F 11:15. Caldwell 100. Assistant Professor Vogel.

A study of the principles and practices of public finance, with emphasis on taxation. The topics examined include the role of government services and the need for public revenue; factors influencing choice of taxes; and the practices and issues associated with the various taxes on personal and business income, on property, and on commodity transactions.

550. ECONOMIC ANALYSIS OF PUBLIC RESOURCE INVESTMENT

Spring term. Credit three hours. Primarily for graduate students, but open to seniors. Prerequisite, Economics 311 or 511, or consent of instructor. T 10:10; Th 9:05–11. Warren 232. Assistant Professor Kalter.

The application of economic theory and analysis to the governmental budgeting and expenditure process with emphasis on the welfare criteria of economic efficiency and income distribution. Techniques of benefit-cost analysis, systems analysis, and programming-planning-budgeting systems will be stressed. Attention will be focused on the appropriate level of government for public natural resource investment and the way and means of intergovernmental payments.

637. ADMINISTRATION OF PUBLIC AGRICULTURAL PROGRAMS (S and U optional)

Spring term. Credit two hours. Primarily for graduate students. Undergraduate registration by permission of the instructor. F 2:30–4:25. Warren 260. Professor Lutz.

An examination of government organizations for administering and financing public agricultural programs; a study of some problem of administration and finance, including organization of agencies, management of personnel, budgetary management, interagency relationships (national, state, and local), and relationships among national, state, and local levels of government. Course 330 or one or more courses in government and public administration are desirable before taking this course.

650. WORKSHOP ON RESOURCE ECONOMICS

Fall term. Credit variable, two to six hours. T 3–5:30. Warren 260. Assistant Professors Kalter and Vogel.

The application of economic theory and analysis to governmental decision making with emphasis upon graduate students' research. Each year it is

planned that a central theme or topic will be emphasized and discussion will center around this theme. Three or four times during the semester, people doing research and writing in the areas under discussion will be invited from other universities to discuss their work with the members of the workshop.

Marketing and Food Distribution

240. MARKETING

Fall or spring term. Credit three hours. Lectures, M W F 11:15. One discussion period only, during the first week of the term: M T W Th or F 2:30–4:25 or S 9:05–11. Warren 45. Professor Darrah.

A study of how food products are marketed. Special attention is given to the consumption of food products, factors that affect consumption, market channels, operation of different marketing agencies, storage, transportation, packaging, product identification, advertising and promotion, buying, selling, and costs.

346. MARKETING MILK AND DAIRY PRODUCTS

Fall term. Credit three hours. Lectures, M W F 11:15. Warren 345. Discussion period, F 12:20. Warren 260. Professor Story.

A review of the economic characteristics of the dairy industry, and an analysis of the marketing and pricing systems for market milk. Particular attention will be given to problems and resulting government programs, including marketing orders, price support operations, and public regulation of competition.

347. MARKETING INSTITUTIONS

Spring term. Credit two hours. Prerequisite, Course 240 or its equivalent. Enrollment limited to 35. M 12:20. Warren 245. Professor Dominick.

Economic functions performed by various types of specialized marketing agencies, with an emphasis on their physical operating patterns. Five days of spring vacation are spent in New York City inspecting and studying the major terminal marketing institutions. Total cost of the trip need not exceed $60 in addition to transportation to and from New York.

441. FOOD DISTRIBUTION

Fall term. Credit four hours. Open to juniors, seniors, and graduate students. Prerequisites, Courses 240 and 327. M W F 10:10 and F 2–4:25. Warren 245. Professor Earle.

A study of the structure and the competitive nature of the food industry. Particular attention is given to an analysis of the gross margin, expenses, earnings, and performance of food retailers. Government regulations with regard to mergers and buying and selling activities are examined. Leading food industry authorities frequently join the discussion session on Friday afternoons.

443. FOOD INDUSTRY MANAGEMENT

Spring term. Credit four hours. Open to juniors, seniors, and graduate students. Prerequisite, Course 441. M W F 10:10 and F 2–4:25. Warren 245. Professor Earle.

A case study approach is used to examine the application of management principles and concepts to operating problems of food retailers. Areas included are site selection, buying, merchandising, personnel administration, private

label products, and financing expansion programs. Leading food industry operating specialists frequently join the discussion session on Friday afternoons.

445. FIELD STUDY OF FOOD INDUSTRIES

Spring term. Credit two hours. Registration by permission. W 12:20. Warren 245. Mr. German.

Observations are made of the organization and operating of businesses in the food industry. Trips are made to manufacturers, processors, wholesalers, and retail firms throughout the term. Five days of spring vacation are spent in New York City and Boston visiting food distribution firms.

446. ECONOMICS OF FOOD MARKETING

Spring term. Credit three hours. Open only to seniors. Prerequisites, Economics 101 and 102, Course 240. Sections limited to thirty students. M W F 9:05 or 11:15. Warren 260. Associate Professor Padberg.

A study of the organization of the agricultural marketing system and the nature of competition developing therein. Food industry structure and performance are appraised in light of current economic theory. Public regulation of competition in food marketing is also covered.

540. INTRODUCTION TO MARKETING RESEARCH

Spring term. Credit two hours. Open only to graduate students. Th 2:30–4:25. Warren 201. Professor Brunk.

Objectives of marketing research, organization and management of research agencies, problem identification, selecting and planning projects, preliminary investigation procedures, surveys, experimental designs, field and office supervision, preparation of reports, and application of results.

541. FOOD MERCHANDISING

Fall term. Credit two hours. Open only to graduate students. Th 2:30–4:25. Warren 145. Professor Brunk.

A seminar course exploring alternative merchandising and promotional devices for food industry retailers and manufacturers. Special attention is given to identification and measurement of basic forces having an impact on consumer buying behavior.

544. INTERREGIONAL COMPETITION

Spring term of even-numbered years. Credit two hours. Prerequisite, Course 508 or equivalent. Hours to be arranged. Warren 302. Professor How.

The application of economic theory and quantitative methods to analyses of the location of agricultural production and marketing facilities, regional and international trade, and spatial and temporal price equilibrium. Selected studies of problems in these areas will be examined.

548. QUANTITATIVE METHODS IN AGRICULTURAL ECONOMICS (S and U optional)

Spring term. Credit three hours. Open only to graduate students. Prerequisite, Course 508 and some knowledge of computer programming which may be obtained concurrently. Time and place to be arranged. Professor How.

The application of quantitative methods to the improvement of decisions in agricultural economics. An introduction to the use of Markov processes, queuing models, simulation, project evaluation and review technique, dynamic programming, replacement theory, and inventory models. Emphasis will be placed on the applications of each technique to the area of interest.

641. MARKETING AND PRICING EFFICIENCY

Fall term. Credit three hours. Open only to graduate students. Registration by permission. T Th 12:20–2:15. Warren 260. Associate Professor Forker.

The application of economic theory (production and consumption economics) and quantitative methods to adjustment problems in agricultural marketing. Includes topics on reformulation of the theory of the firm, economies of scale, theory of markets, economics of distribution, measurement of relative economic efficiencies, pricing in an imperfectly competitive market, market and price manipulation, marketing orders, simulation and systems analysis.

642. MARKET ORGANIZATION AND STRUCTURE

Spring term. Credit three hours. Open only to graduate students. Registration by permission. T Th 1–2:15. Warren 260. Associate Professor Padberg.

A seminar course exploring the relationship of market organization and structure to the combined efficiency of production and marketing processes. Alternative market structures will be examined with respect to supply arrangements, market outlets, business considerations, and environmental conditions.

Land Economics

150. THE ECONOMICS OF AGRICULTURAL GEOGRAPHY

Fall term. Credit four hours. Lectures, M W F 9:05, Warren 45, or M W F 11:15, Warren 131. Discussion, T W Th or F 2:30–4:25. Warren 245 and 345. Professor to be appointed.

The economics and geography of the world's agriculture, providing a basis for understanding past development and future changes in agriculture. Elementary economic principles, historical development, physical geography, and population growth are studied in their relation to agricultural development and the economic problems of farmers. Particular emphasis is placed upon study of the agriculture of various farming regions of the United States, their economic problems and competitive situation.

450. RESOURCE ECONOMICS

Fall term. Credit three or four hours. Suggested prerequisites: one course which stresses the concepts of economics and Conservation 201 or consent of the instructor. Lectures, T Th 10:10. Bradfield 105. Discussion, T 1:25–3:25 and as arranged. Associate Professor Allee.

A review of the application of economic concepts to problems in the use of natural resources including, but not restricted to, water, land, forests, fisheries, and the environment with emphasis on the public management point of view. Attention will be given to concepts of regional growth and public decision making in the resources area.

452. REGIONAL AGRICULTURAL ANALYSIS

Spring term. Credit four hours. Prerequisites: Courses 150 and 302 should precede or accompany this course. Lectures, M W F 9:05. Warren 345. Discussion and laboratory, T or Th 2–4:25. Warren 160. Three field trips are 2–5 and two are 1–5:30. Professor Conklin.

Methods for evaluating agricultural possibilities in both advanced and less developed areas: physical land variability; physical classifications and descriptions; production functions as a link between physical and economic studies;

concepts, theories and techniques for evaluating economic alternatives; the relevance of institutional and other social factors; relationships between the agricultural sector and other sectors in an area economy; and methods for presenting analytical results, including economic classification systems.

552. SPECIAL PROBLEMS IN LAND ECONOMICS

Fall or spring term. Credit one or more hours. Open only to graduate students. Prerequisite, Course 452 and permission of the instructor. Professor Conklin and Associate Professor Allee.

Special work on any subject in the field of land economics that is of particular interest to the student. The student normally is expected to prepare a report on his work that is suitable for mimeograph reproduction and distribution.

652. READINGS IN PHILOSOPHY

Spring term. Credit three hours. Open only to Ph.D. candidates. S 9:05–12. Warren 260. Professor Conklin.

Readings are selected for their relevance to research in agricultural economics and are chosen from among such items as structure of scientific revolutions, theory of experimental inference, the nerves of government, the structure of economic science, economic philosophy, and probability statistics, and truth. Grades are based on notes made during the term on readings and discussions.

Economics of Agricultural Development

464. ECONOMICS OF AGRICULTURAL DEVELOPMENT (S and U optional)

Spring term. Credit three hours. Prerequisite, Course 150, or Economics 101–102, or consent of the instructor. Lectures, T Th S 9:05. Warren 345. Professor Mellor.

A discussion of the special problems of agricultural development, in low per capita income areas and countries. Attention will be devoted to the relationship between development in agriculture and in other sectors of the economy, capital and capital formation, the role of land and land reform, increasing efficiency in resource use, coordination problems in agricultural development, and the like.

560. ECONOMIC ASPECTS OF THE WORLD'S FOOD

Fall term. Credit three hours. Given in odd numbered years. Primarily for graduate students, but open to seniors with permission of the instructor. Prerequisite, basic economics and a course in economic development. Time to be arranged. Associate Professor Poleman.

Designed for students in economics and agricultural economics who are interested in the problems associated with quantification of the "Malthusian dilemma." Briefly considered are human food requirements, the major food groups, and the geography of world food production and consumption. Also examined are national diets and historical trends in food consumption. Prime attention is devoted to techniques for data evaluation, including food balance sheets and consumption surveys, and the interrelations between population, food and economic progress.

664. SEMINAR ON THE AGRICULTURAL DEVELOPMENT OF SOUTH ASIA

Spring term. Credit two hours. Open only to graduate students who have completed Course 364 or its equivalent. Times to be arranged. Professor Mellor.

665. SEMINAR ON LATIN AMERICAN AGRICULTURAL POLICY

Fall term. Credit three hours. Prerequisite, basic economics. Knowledge of Spanish or Portuguese is desirable. T 2:30–4:25, plus a weekly meeting with the instructor. Warren 145. Associate Professor Freebairn.

An examination of policies for the development of the agricultural sector in Latin America, including an identification of policy objectives and a review of the instruments of public policy implementation. Particular attention is paid to the contribution of research studies in agricultural policy formation and accomplishment.

667. SEMINAR ON THE ECONOMICS OF TROPICAL AGRICULTURE

Fall term. Credit three hours. Given in even numbered years. Primarily for graduate students, but open to seniors with permission of the instructor. Prerequisite, basic economics and a course in economic development. F 2:30–4, plus an individual weekly meeting with the instructor. Warren 31. Associate Professor Poleman.

An examination of the production, distribution, and consumption of agricultural commodities in the tropical countries. Emphasis will be on statistical sources and methods for their appraisal. Student participation and the preparation of a research paper will be stressed.

668. SEMINAR IN THE ECONOMICS OF AGRICULTURAL DEVELOPMENT (S and U exclusive)

Fall term. Credit two hours. Open only to graduate students with permission. Time to be arranged. Professors Barraclough, Conklin, and Mellor, Associate Professors Call, Freebairn, Poleman, Sisler, and other staff.

A joint exploration by the departmental staff in international agriculture of current topics in economic development with respect to agriculture. Intended primarily to facilitate the exchange of ideas among staff members, the seminar will be open to a limited number of advanced graduate students. Each student participant will be expected to prepare and defend a paper on a topic associated with his dissertation research.

Other

380-H. INDEPENDENT HONORS RESEARCH IN SOCIAL SCIENCE

Throughout the year. Credit one to six hours. Open only to candidates who have met the requirements for the Honors Program listed on page 38. A maximum of six credits may be earned in the Honors Program.

499. UNDERGRADUATE RESEARCH

Fall and spring terms. Credit one to three hours depending upon the problem undertaken and the extent and quality of work done. A student desiring to register must attach to preregistration material, the written permission of the staff member who will supervise the work and assign the grade. Open to seniors with quality point averages of 2.7 or higher. Designed to afford opportunities for outstanding undergraduates to carry out independent studies of suitable problems under appropriate supervision.

690. SEMINAR IN AGRICULTURAL ECONOMICS EXTENSION (S and U exclusive)

Fall term. Credit two hours. Primarily for graduate students. M 2–4:25. Warren 448. Professor C. A. Bratton.

The scope and nature of agricultural economics extension work will be considered. This will include early development of extension work in agricultural economics, objectives of agricultural economics extension; how programs are developed; extension methods used; and the importance of coordinating research and extension projects.

Current economic extension programs will be examined in detail.

The seminar is designed to familiarize students with the extension phase of agricultural economics.

AGRICULTURAL ENGINEERING

Students in the College of Agriculture with a major interest in a semitechnical agricultural engineering program may elect a varied sequence of courses that will prepare them for opportunities with many of the industries, organizations, and agencies serving agriculture or for farming enterprises which increasingly require understanding and application of engineering principles. A suggested sequence of courses may be obtained directly from the department.

Students interested in a professional career in agricultural engineering for research, teaching, extension, design, product development, and manufacturing must take a prescribed sequence of courses that leads to a degree granted by the College of Engineering. The detailed curriculum may be found in the *Announcement of the College of Engineering*.

104. ELEMENTS OF AGRICULTURAL ENGINEERING

Fall term. Credit three hours. Lectures, T Th 10:10. Recitation period, F 11:15 or 12:20. Riley-Robb 125. Laboratory M T W or Th 1:25–4. (Th laboratory open only if numbers require.) Limited to twenty-five students per laboratory section. Riley-Robb 160. Associate Professor Ludington.

An introductory course covering two areas: (1) energy and its utilization in agriculture, which will include basic energy principles, electricity, lighting, electric motors, refrigeration, heat, internal combustion engines, solar and atomic energy; and (2) rural water systems including treatment, pumps, and domestic waste treatment.

106. MECHANICAL DRAWING

Fall term. Credit three hours. Lectures, T Th 8. Riley-Robb 105. Laboratory, W 1:25–4:25. Riley-Robb 425. Limited to forty students per laboratory. Book and supply lists are available at the book stores. Mr. Longhouse.

Graphic presentation, including lettering, use of instruments; orthographic projection of multiview drawings including sections, auxiliaries, plans and elevations; pictorial drawing, graphs and charts; elementary descriptive geometry; and the practical applications of these principles to simple problems. Both machine drawing and architectural drawing conventions and practices are discussed and employed in the solution of drawing problems.

107. ADVANCED MECHANICAL DRAWING

Spring term. Credit three hours. Prerequisite, Course 106 or sufficient high school drawing. Lectures, W F 8. Laboratory, Th 1:25–4:25. Riley-Robb 425.

Limited to forty students. Book and supply lists are available at the book stores. Mr. Longhouse.

A continuation of Course 106 with work on machine drawing, including assembly drawings; intersections; developments; descriptive geometry; sectional and auxiliary views; and the use of conventional practices and symbols. Also studied are graphical methods related to other engineering courses and practical engineering problems; these include engineering graphs and charts; nomography; vector geometry and graphical calculus.

The student will be allowed to perform much of his drawing work with the aid of drafting machines. Advanced drafting techniques are also discussed, illustrated, and employed as time permits.

152. INTRODUCTION TO AGRICULTURAL ENGINEERING MEASUREMENTS

Spring term. Credit three hours. Prerequisite, one term of calculus or concurrent registration. Lecture, T 8. Laboratories, W and F 1:25–4:25. Associate Professor Rehkugler.

A study of the principles and methods of engineering measurements. Fundamentals of measurement, sources of errors, and measurement systems will be considered, including surveying measurements. Special attention will be given to methods for obtaining measurements that are required in a variety of agricultural engineering problems. CUPL, the Cornell computing language will be taught, and used in the solution of these problems.

153. ENGINEERING DRAWING

Fall term. Credit three hours. Open only to plan A and professional engineering students. Lectures, M W 9:05. Riley-Robb 105. Laboratory, M or T 1:25–4:25. Riley-Robb 425. Mr. Longhouse.

Designed to promote an understanding of the engineer's universal graphic language. The lectures will deal primarily with spatial relationships involving the problem-solving techniques of descriptive geometry. The laboratories will develop a working knowledge of drawing conventions, standard and advanced drafting techniques, and their application to machine, architectural, and pictorial drawing problems. Graphs and engineering graphics (nomography and graphical calculus) will also be included. Students will accomplish their work with drafting machines as well as the standard T-square and board. The first half hour of the laboratory will be utilized as an instruction-recitation period.

204. WOODWORKING AND CARPENTRY

Fall term. Credit two hours. Lecture, T 9:05. Riley-Robb 125. Laboratory, T W or Th 1:25–4:25. Riley-Robb 70. Limited to fifteen students per section. Associate Professor Lechner.

Designed to acquaint the student with the woodworking, carpentry, concrete, tool-fitting, and wood-finishing jobs common to the farm and home. The skill in use of both hand and power tools is emphasized in the construction and repair of farm equipment. A field trip is included to a local woodworking plant and sawmill.

205. FARM METAL WORK

Fall or spring term. Credit two hours. Lecture, Th 9:05. Riley-Robb 125. Laboratory, including metal lathe work, M 1:25–4:25 (limited to twenty-four students). Laboratory, not including metal lathe work, fall term, T; spring term, T or Th 1:25–4:25 (limited to twenty students). Riley-Robb 60 and 64. Associate Professor Lechner.

Instruction and practice in the fundamentals of electric arc welding, oxyacetylene welding, sheet metal work, pipe fitting, hot and cold metal work, and metal lathe work as they apply to farm shop work for both repair and construction jobs.

222. FARM SURVEYING (S and U optional)

Spring term. Credit three hours. Lectures, T Th 9:05. Riley-Robb 105. Laboratory, M T or W 1:25–4:25. Riley-Robb 15. Associate Professor Black.

An introduction to plane surveying. The use and care of surveying equipment is stressed, with particular reference to problems in agriculture.

233. FARM STRUCTURES (S and U optional)

Fall term. Credit three hours. Prerequisites, intermediate algebra and physics. Lectures, M W F 8. Riley-Robb 105. Associate Professor Lorenzen.

A study of the facilities and equipment for livestock production and crop storage, with emphasis on farm buildings from the viewpoint of structural design, environment, and materials handling.

234. FARM STRUCTURES LABORATORY

Fall term. Credit two hours. Open only to agricultural engineering students who are currently taking or have previously taken Course 233 and Drawing 106. Laboratory, Th or F 1:25–4:25. Riley-Robb 307. Two field trips start at 1 p.m. Limit, fifteen students per section. (Friday section open only when numbers require.) Associate Professor Lorenzen.

Practice in layout of livestock production facilities including field trips to typical installations. Problems in structural design, insulation and ventilation. Studies of wood and concrete as structural materials.

305. ADVANCED FARM METAL WORK

Fall or spring term. Credit one or two hours. Fall term, machine shop instruction; spring term, advanced welding and metal projects. Spring term prerequisite, Course 205, its equivalent, or permission of instructor. Laboratory for one credit, F 1:25–4; for two credits, one additional 2½ hour laboratory to be arranged. Riley-Robb 60 and 64. Associate Professor Lechner.

311. FARM MACHINERY (S and U optional)

Spring term. Credit two hours. Not open to freshmen. Lectures, T Th 11:15. Riley-Robb 125. One recitation each week F 8, 9:05, 10:10, or 11:15. Riley-Robb 225. Limited to 15 students per recitation. Professor Millier.

A study of the operating principles, use, selection, and methods of estimating costs of owning and operating farm machinery and equipment. Machines in each of the following groups are included: tillage, seeding, fertilizer application, pest control, harvesting, processing, and crop handling.

312. FARM POWER

Fall term. Credit three hours. Prerequisite, Course 104 or Physics 102, or the equivalent. Lectures, T Th 11:15. Riley-Robb 125. Laboratory, M T or Th 1:25–4:25. Riley-Robb 74. Professor to be appointed.

A study of the principles of operation and adjustment of internal combustion engines and their farm applications. Other topics covered include tractor transmissions, Nebraska Tractor Tests, tractor stability, fuels, hydraulics, and economic factors.

313. ELECTRICITY ON THE FARM

Spring term. Credit three hours. Given in alternate years. Prerequisite, Course 104 or Physics 102 or the equivalent. Lectures, T Th 10:10. Riley-Robb 105. Laboratory, T or Th 1:25–4:25. Riley-Robb 164. Professor Shepardson.

The application of electricity for light, heat, and power on farms, with emphasis on the principles of operation, selection, and installation of electrical equipment for the farmstead. Laboratory sections are combined for one half-day field trip.

314. FARM MACHINERY LABORATORY

Spring term. Credit two hours. Open to agricultural engineering students or others only by permission of the instructor. Prerequisites, Physics 102 or equivalent, and co-registration in Course 311. Laboratory, T or W 1:25–4:25. Riley-Robb 74. Limited to 12 students per laboratory. Professor Millier.

Designed to give the student practice in the calibration of seeding, fertilizing, and pesticide application machinery and to study the functional characteristics of agricultural machines and machine components.

321. SOIL AND WATER CONSERVATION (S and U optional)

Fall term. Credit two hours. Prerequisite, Agronomy 200 or equivalent. Course 222 is recommended. Must be taken with Agronomy 321. Lecture, F 8. Riley-Robb 15. Laboratory, M or T 1:25–4:25. Riley-Robb 72. Professor Levine.

A study of the principles and practices used in soil and water conservation. Engineering aspects of erosion control, water management and storage, drainage, and irrigation receive primary consideration.

401. SPECIAL PROBLEMS IN AGRICULTURAL ENGINEERING

Fall or spring term. Credit one or more hours. (Normally reserved for seniors in upper two-fifths of class.) Prerequisites, adequate ability and training for the work proposed. Undergraduates must attach to their preregistration material, written permission from the staff member who will supervise the work and assign the grade. Staff.

Special work in any area of agricultural engineering on problems under investigation by the department or of special interest to the student, provided, in the latter case, that adequate facilities can be obtained.

421. INTRODUCTION TO ENVIRONMENTAL POLLUTION (S and U optional)

Spring term. Credit three hours. Lectures, M W 9:05. Discussion, F, one hour to be arranged. Riley-Robb 307. Associate Professor Ludington.

A general course dealing with the impairment of the environment by the wastes of man. The causes and effects of air, water and soil pollution will be discussed. Fundamental factors underlying the waste production, abatement, treatment and control will be included. A selected number of wastes from urban, rural and industrial areas will be used to illustrate the factors.

450. SPECIAL TOPICS IN AGRICULTURAL ENGINEERING (S and U exclusive)

Spring term. Credit one hour. Open only to seniors. T 12:20. Riley-Robb 225 Professor French.

Presentation and discussion of the opportunities, qualifications, and responsibilities for positions of service in the various fields of agricultural engineering.

[461. AGRICULTURAL MACHINERY DESIGN

Spring term. Credit three hours. Given in alternate years. Prerequisite, kinematics and components of machines. Two lectures, one laboratory. Time and place to be arranged. Professor Gunkel.] Not given in 1969–70.

The principles of design and development of agricultural machines to meet functional requirements. Emphasis is given to computer-aided analysis and design, stress analysis, selection of construction materials, and testing procedures involved in agricultural machine development.

462. AGRICULTURAL POWER

Fall term. Credit three hours. Given in alternate years. Prerequisites, Engineering 212, or the equivalent. Two lectures, one laboratory and computing period. Time and place to be arranged. Professor to be appointed.

Basic theory, analysis and testing of internal combustion engines specifically for use in farm tractors, and other agricultural power applications. Tractor transmissions, Nebraska Tractor Tests, soil mechanics related to traction stability, shop dynamometers, fuels, and hydraulic equipment.

[463. PROCESSING AND HANDLING SYSTEMS FOR AGRICULTURAL MATERIALS

Spring term. Credit four hours. Given in alternate years. Prerequisite, Engineering 212 or the equivalent. Three lectures and one laboratory. Time and place to be arranged. Associate Professor Furry.] Not given in 1969–70.

Processes such as size reduction, separation, metering, drying, and refrigeration will be studied. Psychrometrics, fluid flow measurement, and an introduction to dimensional analysis, systems engineering, and controls for agricultural applications are included.

471. SOIL AND WATER ENGINEERING

Spring term. Credit three hours. Given in alternate years. Prerequisites, fluid mechanics and soils, or concurrent registration. Three lectures, one laboratory every other week. Time and place to be arranged. Associate Professor Black.

The application of engineering principles to the problems of soil and water control in agriculture. Includes design and construction of drainage systems and farm ponds, design and operation of sprinkler systems for irrigation.

481. AGRICULTURAL STRUCTURES

Spring term. Credit three hours. Given in alternate years. Prerequisites, structural engineering and thermodynamics. Lectures, T Th 11:15. Laboratory, W 1:25–4:25. Riley-Robb 307. Associate Professor Scott.

Synthesis of complete farmstead production units including structures, equipment, and management techniques. Integrated application of structural theory, thermodynamics, machine design, and methods engineering to satisfy biological and economic requirements.

491. LOW-COST ROADS (S and U optional)

Credit three hours. Offered upon sufficient demand, usually in fall term. Prerequisite, consent of instructor. Principally directed study with one 2½ hour class session per week to be arranged. Professor Spencer.

Study of economic considerations in road system improvement; road improvement planning and programming; road location and geometric design; engineering soil characteristics and classification; design of roadbed thickness; drainage; stabilization methods and materials; dust palliatives; wearing surfaces.

501. SIMILITUDE METHODOLOGY

Spring term. Credit three hours. Prerequisite, consent of instructor. Two lectures, one laboratory. Time and place to be arranged. Associate Professor Furry.

Similitude methodology, including the use of dimensional analysis to develop general equations to define physical phenomena, model theory, distorted models, and analogies. Introduction to a variety of applications in engineering. Problem solutions will employ both analog and digital computers. It is preferred that the student know how to program in Fortran, although knowledge of CUPL is acceptable.

502. INSTRUMENTATION

Spring term. Credit three hours. Prerequisite, consent of instructor. Two lectures, one laboratory. Time and place to be arranged. Associate Professor Scott and staff.

Emphasis on the application of instrumentation concepts and systems to physical and biological measurements. Characteristics of instruments, signal conditioning, shielding and grounding; transducers for measurement of force, pressure, displacement, velocity, acceleration, temperature, humidity, flow; and data acquisition systems, including telemetry, are covered.

504. BIOLOGICAL ENGINEERING ANALYSIS

Fall term. Credit three hours. Prerequisite, consent of instructor, or Engineering 1151. Lectures, M W F 9:05. Riley-Robb 225. Assistant Professor Cooke.

Engineering problem-solving techniques will be treated. Particular attention will be given to the formulation of biological problems in an engineering context. Experience will be gained in problem definition, mathematical formulation, and interpretation of results. Principles of feedback control theory will be studied and applied to biological systems.

505. SOLID WASTE MANAGEMENT

Spring term. Credit three hours. Prerequisite, permission of instructor. Time and place to be arranged. Professor Lochr.

Study of municipal, industrial and agricultural solid wastes. Emphasis on waste characteristics, method of treatment and disposal and interrelationship with air, water and land environment. Discussion of economic and political aspects. Intended primarily for graduate students but open to qualified undergraduates.

551–552. AGRICULTURAL ENGINEERING PROJECT

Fall and spring term. Total credit six hours. Required for M. Eng. degree. Staff.

Comprehensive design projects utilizing real engineering problems. Emphasis on formulation of alternate design proposals, including economics and nontechnical factors, and complete design of the best alternative.

601. GENERAL SEMINAR

Fall and spring term. M 12:20. Riley-Robb 400. Fall term required of all graduate students majoring in the field. Spring term optional. Staff.

602. POWER AND MACHINERY SEMINAR

Spring term. Credit one hour. Prerequisite, graduate status and permission of instructor. Time and place to be arranged. Staff.

Study and discussions of research and new developments in agricultural power and machinery.

603. SOILS AND WATER ENGINEERING SEMINAR

Spring term. Credit one or two hours. Prerequisite, graduate status and permission of instructor. Time and place to be arranged. Staff.

Study and discussion of research on selected topics in irrigation, drainage, erosion control and agricultural hydrology.

604. AGRICULTURAL STRUCTURES AND RELATED SYSTEMS SEMINAR

Spring term. Credit one hour. Prerequisite, graduate status and permission of instructor. Time and place to be arranged. Staff.

Study and discussion of farmstead production problems, with emphasis on biological, economic, environmental and structural requirements.

605. AGRICULTURAL WASTE MANAGEMENT SEMINAR

Fall and spring terms. Credit one hour. Prerequisite, graduate status and permission of instructor. Time and place to be arranged. Staff.

Study and discussion of the management of agricultural waste, with emphasis on the physical, chemical, biological, economic, and aesthetic requirements.

AGRONOMY

The Department of Agronomy offers instruction in both soils and field crops. It accepts as majors both students who are preparing for scientific professions and those who are interested primarily in applications of soil and crops subjects to practical problems. To accommodate all of these interests, the Department offers four areas of specialization: (1) crop science; (2) soil science; (3) crops; and (4) soils (including soil conservation). In addition to College requirements, all of these specializations require a minimum of fifteen semester hours of agronomy, an elementary course in plant physiology, and demonstrated interest in the field.

Students preparing for graduate studies or scientific careers should choose the crop science or soil science specialization. Both require, in addition to the general requirements listed, a minimum of two semesters of calculus and fourteen semester hours chosen from among designated advanced courses in chemistry and physics. Emphasis is placed on the basic physical and biological sciences, and work in agronomy and related fields is selected to complement that training. The soil science curriculum satisfies requirements for professional certification by the Soil Science Society of America.

Students concerned primarily with applications of technical soil and crop subject matter to practical problems should specialize in soils or crops. Minimum departmental requirements are those common to all agronomy students. Curricula emphasize applied courses in agronomy and related fields, supported by those courses in basic physical and biological sciences essential for technical competence in the specialty.

Soil Science

200. NATURE AND PROPERTIES OF SOILS (S and U optional)

Fall or spring term. Credit four hours. Prerequisites, Chemistry 103, 107, 115, or Biological Science 131. Lectures, M W F 9:05. Bradfield 101. Laboratory: fall term, M T W Th or F 2–4:25; spring term, M T W Th or F 2–4:25; or S

10:10–12:35. Bradfield 102. Fall term, Professor Lathwell. Spring term, Associate Professor T. W. Scott.

A comprehensive introduction to the field of soil science with emphasis on scientific principles and their application in solutions of practical soil management problems.

301. IDENTIFICATION, APPRAISAL, AND GEOGRAPHY OF SOILS (S and U optional)

Spring term. Credit four honors. Prerequisite, Course 200 or permission of the instructor. Lectures, M W F 11:15. Laboratory, M 2–4:25. Bradfield 105. Associate Professor Arnold.

The soil as a natural body. Principles of identification and classification of geographic units of soil and interpretation of such units for applied objectives. Geography of major kinds of soil of North America in relation to environment and cultural patterns. Field practice characterizing, mapping, and interpreting geographical soil units.

306. SOIL MICROBIOLOGY, LECTURES

Spring term. Credit three hours. Prerequisite, Course 200 or Biological Science 290. Lectures, M W F 8. Bradfield 108. Professor Martin Alexander.

A study of the major groups of soil microorganisms, their ecological interrelationships, and the biochemical functions of the soil population.

307. SOIL MICROBIOLOGY, LABORATORY

Spring term. Credit one hour. Prerequisite, concurrent registration in Course 306. Hours to be arranged. Bradfield 502. Professor Martin Alexander.

Laboratory exercises concerned with the ecology and biochemical activities of soil microorganisms.

310. AGRONOMY LITERATURE (S and U optional)

Spring term. Credit one hour. Prerequisites, Courses 200 and 111 or their equivalents. Beginning graduate students accepted by permission of the instructor. Th 12:20. Bradfield 105. Associate Professor T. W. Scott.

In addition to study of research and extension periodicals reporting work in agronomy, each student will review several scientific articles and prepare an essay on an appropriate subject in agronomy.

321. SOIL AND WATER CONSERVATION (S and U optional)

Fall term. Credit two hours. Prerequisite, Course 200 or equivalent. Course 111 is recommended. Must be taken with Agricultural Engineering 321. Lectures, M W 8. Riley-Robb 15. Professor Zwerman.

A study of the principles and practices used in soil and water conservation. Agronomic aspects of erosion control, water management and storage, drainage, and irrigation receive primary consideration.

324. SOIL FERTILITY AND FERTILIZERS

Fall term. Credit three hours. Prerequisite, Course 200 or permission of the instructor. Lectures, M W F 9:05. Bradfield 108. Associate Professor Bouldin.

An integrated discussion of soil-plant relationships with emphasis on the soil as a medium for root growth, the soil as a source of mineral nutrients for plants, resources required for fertilizer production, and the role of fertilizers in crop production.

401. GEOGRAPHY AND APPRAISAL OF SOILS OF THE TROPICS (S and U optional)

Spring term. Credit three hours. Lectures, W F 12:20. Discussion, F 2:30–4:25. Bradfield 105. Professor Drosdoff.

Character, production potential, and management requirements of soils of tropical rain forests, tropical savannahs, tropical deserts, and tropical highlands, including soils under paddy culture. Emphasis is on soil properties associated with the principal kinds of soil and bases for their interpretation in terms of production potential and management requirements. Lectures are used to introduce principles whose applications are treated by problem-solving, discussion, and independent study of the literature. Individuals who have not had the equivalent of Course 200 will be expected to become familiar with elementary principles of soil by self-study.

402. CHEMICAL METHODS OF SOIL ANALYSIS

Spring term. Credit three hours. Prerequisites, Course 200 and Chemistry 236 or their equivalent. T Th 2–4:25. Bradfield 902. Professor Peech.

Lectures, laboratory exercises, and demonstrations designed to familiarize the student with different chemical techniques for studying soils.

403. ORGANIC SOILS

Fall term. Credit two hours. Given in alternate years. Prerequisite, Course 200. Lecture, T Th 9:05. Bradfield 105. Professor Dawson.

Physical and chemical properties of organic soils used for crop production and soil conditioning. One all-day Saturday field trip.

[404. FOREST SOILS

Fall term. Credit two hours. Given in alternate years. Prerequisite, Course 200. T Th 8. Bradfield 105. Professor Stone.] Not given in 1969–70.

Ecology of forest and wildland soils, including relationships to soil development, vegetation and land use. Occasional field trips to be arranged.

[405. SOIL MINERALOGY

Fall term. Credit three hours. Given in alternate years. Prerequisites, Course 200, and one year each of college chemistry and physics or consent of instructor. Lectures, T Th 9:05. Bradfield 110. Laboratory, W 2–4:25. Bradfield 105. Professor to be appointed.] Not given in 1969–70.

A study of the minerals found in soils, their structures, properties, and weathering characteristics, and a study of some methods used in making mineralogical determinations.

406. USE OF SOIL INFORMATION AND MAPS AS RESOURCE INVENTORIES (S and U optional)

Fall term. Credit two hours. Given in alternate years. T Th 11:15. Bradfield 105. Assistant Professor Olson.

Principles, practices, and research techniques in interpreting soil information and maps for planning, developing, and using areas of land.

408. SOIL PHYSICS, LABORATORY

Fall term. Credit two hours. Prerequisite, Course 200. Lecture, T 11:15. Laboratory, Th 1:25–4:25, or as arranged. Bradfield 502. Assistant Professor Fritton.

Experimental methods used in soil physics.

450. SPECIAL TOPICS IN SOIL SCIENCE (S and U optional)

Fall and spring terms. Credit one to six hours. Undergraduates must attach to their preregistration material, written permission from the staff member who will supervise the work and assign the grade. The topics to be treated will be arranged at the beginning of each term for individual self-study or for group discussions. Time to be arranged. Staff.

461. REGIONAL AGRONOMY STUDIES

Fall term. Credit four hours. Prerequisites, Courses 111 and 200 and permission of the instructor. Enrollment limited and must be approved by instructor in charge during preregistration. Discussion, two hours per week. W F 12:20. Bradfield 135. Three weeks field study trip during August 1969. Professor Wright and staff.

Study of soils, crops, agriculture, agricultural institutions, and agricultural industries of midwestern regions of the United States. The purpose is to give breadth of understanding of the field of agronomy and perspective of its applications. During the summer field study trip, each student will be required to keep complete notes of basic subject matter for seminars, discussion and assignments during the fall semester. A written report of the field trip is required of each student. Transportation will be provided from Ithaca to western regions and return. Students must finance meals and lodging, costs of which will be held to a minimum.

470. UNDERGRADUATE RESEARCH IN SOIL SCIENCE

Fall and spring terms. Credit to be arranged. Written permission from the staff member who will supervise the work and assign the grade must be attached to preregistration material. Time to be arranged. Staff.

Independent research on current problems selected from any phase of soil science.

481. SPECIAL STUDIES IN SOILS OF THE TROPICS (S and U optional)

Spring term. Credit three hours. Prerequisites, Agronomy 200 and 301 or equivalent and approval of the professor. Enrollment limited. Lectures and discussion, time to be arranged. Eight- to ten-day field trip to tropical area during January intersession. Preregistration required by December 1. Consult professor in charge regarding financial arrangements. Professor Drosdoff.

This course is designed for advanced students having a primary interest in the tropics. In depth studies of the physical, chemical, and biological characteristics of the soils of the tropics with emphasis on problems of soil fertility, soil-crop management systems, soil classification, etc. The student in independent study of the literature will have an opportunity to concentrate on subject matter and geographic areas of particular interest to him.

501. SOIL CHEMISTRY

Fall term. Credit three hours. Given in alternate years. Prerequisites, Course 200 and a one-year course in introductory physical chemistry, or consent of the instructor. Lectures, T Th S 10:10. Bradfield 108. Professor Peech.

Chemical and mineralogical composition and chemical properties of soils, with emphasis on ionic equilibria in soils.

[503. MORPHOLOGY, GENESIS, AND CLASSIFICATION OF SOILS

Spring term. Credit three hours. Given in alternate years. Prerequisite, graduate standing or permission of the instructor. T Th S 10:10. Bradfield 105. Associate Professor Arnold.] Not given in 1969–70.

Principles of soil classification, reactions and processes of soil genesis, and development and significance of major groups of soils of the world. One all-day field trip on a date to be arranged.

506. ADVANCED SOIL MICROBIOLOGY (S and U optional for graduate students only.)

Fall term. Credit one hour. Prerequisite, Course 306 or permission to register. T 12:20. Bradfield 105. Professor Martin Alexander.

Discussions of current topics in special areas of soil microbiology. Particular attention is given to biochemical problems in microbial ecology.

[507. SOIL PHYSICS, LECTURES

Fall term. Credit three hours. Given in alternate years. Prerequisites, Course 200 and one year of college physics or permission of the instructor. M W F 11:15. Emerson 334. Professor R. D. Miller.] Not given in 1969–70.

A study of physical properties and processes of soil, with emphasis on basic principles.

[524. SOIL FERTILITY, ADVANCED COURSE

Spring term. Given in alternate years. Prerequisite, graduate status, major or minor in agronomy or permission of instructor. Lectures, T Th S 9:05. Bradfield 110. Associate Professor Bouldin.] Not given in 1969–70.

A study of selected topics in soil-plant-fertilizer relationships with emphasis on concepts of soil fertility, interpretation of experimental data, and soil-fertilizer chemistry.

560. GRADUATE RESEARCH IN SOIL SCIENCE

Fall and spring terms. By arrangement. Not open to undergraduates. All members of the graduate field.

Crop Science

111. INTRODUCTION TO CROP SCIENCE

Fall or spring term. Credit four hours. Open to all classes beginning with first semester freshmen. Lectures, M W F 10:10. Bradfield 101. Laboratory: fall term, M T W or Th 2–4:25; spring term, T W Th or F 2–4:25. Emerson 338. Fall term, Assistant Professor Obendorf; spring term, Associate Professor Lucey.

Principles of field crop growth, development and maturation, species recognition, soil and climatic adaptations, liming and mineral nutrition, weed and pest control, cropping sequences, management systems, and crop improvement are considered. Feed crops for livestock and food and fiber crops including hay, silage, pasture, grain, protein and oil crops are emphasized. Two field trips to observe and study a very extensive crop garden and experimental methods and procedures are held during regular laboratory periods.

312. FEED CROPS

Spring term. Credit four hours. Prerequisite, an introductory course in crop production. A course in livestock feeding is desirable but not essential preparation. Lectures, M W F 8. Bradfield 101. Discussion, F 11:15 or 12:20. Emerson 334. Associate Professor M. J. Wright.

The production of field crops with reference to their value for livestock in terms of energy, protein, and other nutritional components. Consideration will

be given to establishment, management, harvesting, and preservation practices that influence yield and nutritive value. Forage grasses, forage legumes, and corn will be emphasized.

313. PHYSIOLOGICAL ECOLOGY OF CROP PLANTS

Fall term. Credit three hours. Prerequisites, Courses 200 and 111 or their equivalents. Lectures, T Th S 9:05. Emerson 334. Professor Musgrave.

Fundamental principles of plant physiology applied to the analysis of the effects of environmental factors on temperature and light reactions, nutrient uptake, and water requirements of crop plants during growth, maturation, and dormancy.

315. WEED CONTROL

Spring term. Credit three hours. Graduate students may register only by permission. Prerequisites, Course 111, Biological Sciences 101–102 or 103–104 or the equivalent. Prior or simultaneous courses in organic chemistry or plant physiology would be desirable. Lectures, T Th 8. Bradfield 108. Laboratory, M 2–4:25. Emerson 334. Assistant Professor Duke.

Principles and methods of weed control. Emphasis given to (a) weed ecology; (b) environmental and soil conditions influencing herbicide action; (c) herbicide chemistry in relation to effects on plant growth; (d) principals of control of weeds in field crops by chemical and cultural methods. Laboratory covers identification of weeds common in northeast, physiology and herbicide action, and spray equipment and its use.

422. TROPICAL AGRICULTURE

Spring term. Credit three hours. Lectures and discussions, M W F 10:10. Bradfield 105. Prerequisites, a course covering elementary botany and permission of instructor. Professor MacDonald.

Designed to provide some knowledge and understanding of the tropical environment and its agriculture. Topics covered include the agriculture, principal crops, cropping practices and problems of the tropics and subtropics. Particular stress is given to (a) agricultural ecology, (b) agricultural patterns, traditions, and problems, (c) economic crops, their botany, adaptation, cultural requirement, improvement, management, protection, production, and use, and (d) resources, limitations and opportunities for tropical agricultural development and improvement. Independent study of the literature is encouraged and facilitated. Lectures supplemented by illustrations, demonstrations and discussions.

431. AQUATIC PLANTS

Fall term. Credit three hours. Prerequisites, Biological Sciences 101–102 or 103–104, or the equivalent. Discussions, T 2–3:45. Bradfield 110. Laboratory, F 2–4:25. Emerson 334. Assistant Professor Mulligan.

Discussion of environmental factors affecting the growth and distribution of fresh water plants. Includes taxonomy and life cycles of common emergent, submerged and floating plants and methods of managing plant populations. Collecting trips will be conducted during laboratory periods to eight lakes in the central New York area.

451. SPECIAL TOPICS IN CROP SCIENCE (S and U optional)

Fall and spring terms. Credit one to six hours. Undergraduates must attach to their preregistration material, written permission from the staff member who will supervise the work and assign the grade. The topic to be treated will be arranged at the beginning of each term for individual self-study or for group discussions. Time to be arranged. Staff.

471. UNDERGRADUATE RESEARCH IN CROP SCIENCE

Fall and spring terms. Credit to be arranged. Written permission from the staff member who will supervise the work and assign the grade must be attached to preregistration material. Time to be arranged. Staff.

Independent research on current problems selected from any phase of crop science.

[513. CROP ECOLOGY

Spring term. Credit two hours. Given in alternate years. Prerequisites, Course 200, 111, and Biological Sciences 240. Class meetings to be twice weekly for first eight weeks of semester for two hours per meeting. Times to be arranged. Professor Musgrave.] Not offered in 1969–70.

An extension of Course 313 and a study of special techniques used to obtain and analyze physiological data on crop plant responses to environmental conditions occurring in the field.

514. GRASSLANDS AND GRASSLAND RESEARCH

Fall term. Credit three hours. Given in alternate years. Prerequisites, Courses 111, 200, and Biological Science 240, or their equivalents, and permission of instructor to register. M W F 9:05. Bradfield 105. Professor H. A. MacDonald.

A study of ecological factors underlying the development, maintenance, production, and management of different grassland types for various uses, and the principles and practices of grassland and forage crop investigations. Grassland species, types, and associations will be discussed in relation to adaptation, production, and use. Emphasis will be on research.

561. GRADUATE RESEARCH IN CROP SCIENCE

Fall, spring, and summer terms. By arrangement. Not open to undergraduates. All members of the graduate field.

Departmental Offerings

550. RESEARCH ORIENTATION AND PERSPECTIVE (S and U optional)

Fall term. Credit two hours. Lectures and discussion, T Th 10:10. Emerson 334. Professor H. A. MacDonald.

A course to familiarize students with the philosophy, organization, method and conduct of research; and to provide information and practice in planning, organizing, writing and oral presentation of results. The latter part of the course will deal with the reporting of research progress and results, both oral and written. Student participation is required.

690. GENERAL DEPARTMENTAL SEMINAR (S and U exclusive)

Fall and spring terms. Required of graduate students majoring or minoring in the department. Alternate weeks. T 4:30. Emerson 135.

691. SOIL SCIENCE SEMINAR (S and U exclusive)

Fall and spring terms, alternating weeks with the General Departmental Seminar. Required of students whose major or minor subject is Soil Science. T 4:30. Emerson 135.

692. CROP SCIENCE SEMINAR (S and U exclusive)

Fall and spring terms. Required of students whose major or minor subject is Crop Science. T 12:20. Emerson 135.

ANIMAL SCIENCE

A comprehensive program of courses is available to students interested in almost any phase of animal science. In consultation with an adviser, a student may select a sequence of courses that would prepare him for (1) livestock farming—dairy cattle, beef cattle, sheep, or swine, horses and laboratory animals; (2) positions in the feed and meat packing industries; (3) service in extension; (4) a variety of agricultural businesses; (5) entry into a veterinary college; or (6) graduate work. In the latter case, the usual program is modified to include the necessary physical and biological sciences that would permit following the more specialized fields of animal nutrition, animal physiology, animal breeding, animal genetics or meat processing.

Students are generally advised to register for Courses 100, 112, and 220 before electing the more advanced courses.

100. INTRODUCTORY ANIMAL SCIENCE (S and U optional)

Fall term. Credit three hours. Lectures, W F 10:10. Morrison 146. Laboratory, T Th or F 2–4:25. Livestock Pavilion. Associate Professor Elliot.

Designed to acquaint the beginning student with the development, scope, economic importance, problems, and language of the livestock industry. All commercially important classes of farm animals are considered, with emphasis on dairy cattle, beef cattle, sheep, and swine. The place of the biological sciences in a rapidly changing animal agriculture is stressed. The intent is to give insight into opportunities in the field, and to serve as an introduction to subsequent specialized courses.

241. APPLIED LIVESTOCK SELECTION AND MEAT EVALUATION: BEEF CATTLE, SHEEP, AND SWINE

Fall term. Credit two hours. Prerequisite, Course 100 or permission to register. Lecture and laboratory period, W 2–4:25. Livestock Pavilion, Barns, and Morrison 82. Professors J. I. Miller and Wellington.

Practical application of the various methods used in determining the utility value of market and breeding classes of meat animals and carcasses. Grading standards, meat quality and yield factors, breeding records, performance and progeny tests are considered. A one-day field trip is taken to study market and consumer acceptability of meat products.

260. BEEF CATTLE

Spring term. Credit three hours. Prerequisite, Course 100 or permission to register. Lectures, T Th 10:10. Morrison 163. Laboratory, F 2–4:25. Livestock Pavilion and Beef Cattle Barns. Professor J. I. Miller.

A general course in beef-cattle production. The management, feeding, breeding, selection, and marketing problems involved in the beef-cattle enterprise are emphasized. A one-day field trip is taken to study successful beef production methods.

265. HORSES

Spring term. Credit two hours. Prerequisite, Course 100 or permission to register. Lecture, Th 9:05. Morrison 146. Laboratory, Th 1:25–4:25. Livestock Pavilion. Assistant Professor Hintz.

A course in selection, management, feeding, breeding, training and marketing of light horses.

278. SHEEP AND SWINE

Fall term. Credit two or four hours. Prerequisite, Course 100. Courses 112 and

220 also recommended. Lectures, T Th 10:10. Morrison 163. Laboratory and discussion periods, M 1:25–4:25. Morrison 164 and Sheep and Swine Barns. Associate Professors Hogue and Pond.

Students may take either the Swine or Sheep section of this course for two hours credit with permission of the instructor.

A general course in the care, breeding, feeding, management, and selection of sheep and swine. Lectures and laboratory periods designed to give the student a practical knowledge of sheep and swine production as well as some scientific background for improved practices.

400. LIVESTOCK PRODUCTION IN THE TROPICS

Spring term. Credit three hours. Prerequisite, Course 100, 112 or 220, or permission of the instructor. Lectures and discussions, T Th 10:10–12:05. Morrison 342. Professor McDowell.

A discussion of the present and potential roles of domesticated animals as a source of food, power, and fiber in tropical areas of the world. The effects of climate on animal performance; the physiology of heat regulation in animals; problems of providing feed supplies in the tropics; systems of breeding; management practices as they affect reproductive performance; animal health and performance traits; the relative efficiency of livestock in the tropics; and economic consideration in the production of livestock products will be summarized.

401. SPECIAL STUDIES IN LIVESTOCK OF THE TROPICS

Spring term. Credit three hours. Prerequisites, Courses 220, 400, 410 and Biological Sciences 413 or permission of instructor. Enrollment limited. Lecture and discussion time to be arranged. Professor McDowell.

Initial briefings will be at end of exam week of the fall term followed by 8–9 day field study trip to a tropical area during January intersession. Preregistration required by December 1. Consult professor in charge regarding financial arrangements for travel and other course requirements.

ANIMAL PHYSIOLOGY (VETERINARY 310)

Spring term. Credit three hours. Prerequisites, one year of biology or zoology and college courses in chemistry. Lectures and demonstrations arranged especially for students of agriculture but open to others. Professor Sellers.

HEALTH AND DISEASES OF ANIMALS (VETERINARY 470)

Spring term. Credit three hours. Not open to first year students or to those who have had no course in animal science. Lectures, M W F 11:15. Veterinary College C 207. Dr. Loomis and collaborators.

The causes and the nature of the common diseases of livestock are discussed. Emphasis is placed on the prevention and control of animal diseases.

Meats

290. MEAT AND MEAT PRODUCTS

Fall or spring term. Credit three hours. Lectures, T Th 9:05. Laboratory, T or W 1:25–4:25. Morrison 82. Associate Professor Stouffer and Professor Baker.

The course deals with the handling of red meat and poultry following slaughter. Composition, postmortem changes, and organoleptic changes of meat will be discussed. The course will also include packaging, preservation, develop-

ment of new products and merchandising of meat, poultry, eggs, and fish. Field trips to commercial plants will be taken.

293. MEAT CUTTING

Fall or spring term. Credit one hour. Prerequisite, Course 290 and permission to register. Enrollment limited to 5 students each term. One laboratory period each week. Time to be arranged with the instructor. Morrison 91. Mr. Holley.

Supervised practice in meat selection, cutting, and merchandising for students with a special interest in meats.

490. MEAT TECHNOLOGY

Spring term. Credit three hours. Prerequisite, Course 290 or by permission. Lecture, T 11:15. Morrison 82. Laboratory, T Th 1:25–4:25. Professor Wellington.

The character of muscle as a food, muscle structure, meat product formulations and production, methods for meat product quality control, product testing and improved meat packaging. The basic principles of meat preservation, processing, and meat product development through laboratory demonstration and practice in the pilot meat plant in Morrison Hall.

Dairy Husbandry

250. DAIRY CATTLE (S and U optional)

Fall term. Credit three hours. Lectures, T Th 9:05. Laboratory, M 2–4:25. Morrison 163. Professor Trimberger and Assistant Professor Tyrrell.

Designed for students with a general interest in dairy cattle and who do not have the prerequisites for Course 350. Students with a major interest in dairy production should take 350.

Characteristics and trends of the dairy industry; study of dairy breeds; factors in breeding and development of dairy cattle; milking methods and milk production problems; efficient feeding; and care, management, formulating rations, planning breeding program, and record keeping.

251. DAIRY CATTLE SELECTION AND TYPE EVALUATION

Spring term. Credit three hours. Laboratory, W 2–4:25 throughout the term, S 10:10–12:35 during first half of term, and all day Saturday during last half of term. Livestock Pavilion. Professor Trimberger.

A beginning course in the selection and type evaluation of all breeds of dairy cattle. Emphasis on herd improvement through high production, and conformation characteristics for practical type to achieve wearability for high lifetime production. Educational lectures, demonstrations, and practice sessions include all day trips to outstanding herds in the state.

350. DAIRY CATTLE PRODUCTION AND MANAGEMENT

Spring term. Credit three hours. (Credit one hour if Course 250 taken previously). Prerequisites, Courses 112, 220, and 221. (Course 221 may be taken concurrently.) Lectures, T Th 11:15–12:05. Laboratory and discussion, T 1:25–4:25. Morrison 163. Associate Professors Merrill and Schmidt and Assistant Professor Tyrrell.

Designed for students who have an extensive interest in dairy cattle production and management. Analysis of dairy cattle breeding, housing, and management systems; development of feeding systems for economical production; and study of the principles of milk secretion and milking procedures, including

evaluation of milking systems. Consideration will be given to the application of modern technology in these areas including farm visits to observe this technology in operation.

352. ADVANCED DAIRY CATTLE SELECTION

Fall term. Credit one hour. Prerequisite, Course 251. Registration by permission. Practice hours to be arranged. Professor Trimberger.

Intended primarily to give additional training in comparative judging to successful students of Course 251. Members of the class are selected to represent the institution in intercollegiate judging competitions.

451. PHILOSOPHY AND BIOCHEMISTRY OF LACTATION

Spring term. Credit three hours. Given if 10 or more students register. Prerequisite, a course in physiology or Course 427. Lectures, T Th 9:05. Morrison 163. Laboratory, Th 2:30–4:25. Morrison 174. Associate Professor Schmidt.

An advanced course in the anatomy of the mammary gland, the physiological mechanisms of milk secretion, and the biochemical synthesis of milk constituents in laboratory and farm animals.

455. DAIRY CATTLE NUTRITION

Fall or spring term. Credit three hours. Prerequisite, a course in animal nutrition or permission of instructor. Given if 8 or more students register. Given under the extramural program at regional locations to be arranged. Lectures and laboratory. Assistant Professor Coppock and staff.

Designed to provide Cooperative Extension Agents and Vocational Agricultural Instructors with in-depth training which relates to the nutrition of the dairy cow. Areas of emphasis will include the anatomy and physiology of the digestive tract, biochemical relationships important in ruminant nutrition, metabolic diseases, and systems of feed analysis and feed formulation. The most recent research findings will be related to practical problems faced by Extension Agents.

456. DAIRY CATTLE PHYSIOLOGY AND MANAGEMENT

Fall or spring terms. Credit three hours. Prerequisite, a course in physiology or permission of instructor. Given if 8 or more students register. Given under the extramural program at regional locations to be arranged. Lectures and laboratory. Assistant Professor Natzke and staff.

Designed for in-depth training in physiology of lactation and reproduction, and dairy cattle management for Cooperative Extension Agents and Vocational Agricultural Instructors. Aspects of anatomy, physiology, and endocrinology will be discussed as they relate to milking, mastitis, housing, calf raising, and other management factors.

Animal Breeding and Physiology

220. ANIMAL REPRODUCTION AND DEVELOPMENT

Fall term. Credit three hours. Prerequisite, Biological Sciences 101 and 102 or 103 and 104 (Limited to forty students per laboratory section.) Lectures. T Th 9:05. Morrison 146. Demonstration and laboratory, M T W Th F 2–4:25, or T 10:10–12:35. Morrison 174. Professor Foote.

An introduction to the comparative anatomy and physiology of reproduction of farm animals. The life cycle from fertilization of ova through development and growth of sexually mature individuals will be studied, with

emphasis on physiological mechanisms involved, relevant genetic control and the application to fertility regulation and improvement of animal populations. Extensive material for practical work will be provided in the laboratory.

221. INTRODUCTORY ANIMAL GENETICS

Spring term. Credit three hours. Prerequisite, Biological Sciences 101 and 102, or 103 and 104. Lectures, M W 10:10. Morrison 163. Laboratory, W or Th 2–4:25. Morrison 342. Assistant Professor P. D. Miller.

An introductory course in the breeding of large animals. Basic genetic principles, heritability of quantitative traits, estimation of breeding value, progeny testing, inbreeding, crossbreeding, lethal genes, genetic resistance to disease.

420. QUANTITATIVE ANIMAL GENETICS (S and U optional)

Fall term. Credit one, three or four hours. Prerequisite, Course 221 or Biological Sciences 281 or permission of instructor. Lectures, T Th 11:15. Laboratory, W or F 2–4:25. Morrison 342. Associate Professor Van Vleck.

A consideration of the problems involved in the improvement of animals, especially farm animals, through the application of the theory of quantitative genetics with emphasis on the selection index. The purpose of the optional (arranged) hour is to give graduate students and qualified undergraduates an introduction to methods of research in quantitative genetics and animal breeding.

424. ANIMAL GENETICS

Fall term. Credit two hours. For veterinary students only. Lecture, M 8:00. Morrison 163. Laboratory, W 10:10–12:35. Morrison 164 and 174. Associate Professor Van Vleck.

Principles of genetics; sex determination and sex linkage; inheritance of characteristics in domestic animals, with special reference to lethal genes, genetic resistance to disease and quantitative characters; progeny testing, genetic relationships and inbreeding.

427. FUNDAMENTALS OF ENDOCRINOLOGY

Fall term. Credit four hours. Prerequisite, a course in human or veterinary physiology, or by permission. Lectures, T Th S 10:10. Morrison 167. Laboratory to be arranged. Professor Hansel.

A general course in the physiology of the endocrine glands, and the roles played by each hormone in the regulation of normal body processes. The laboratory work consists of a series of projects designed to illustrate the basic principles of endocrinology and their applications to more efficient production in all classes of livestock.

430. LIVESTOCK IMPROVEMENT THROUGH ARTIFICIAL BREEDING

Spring term. Credit four hours. Prerequisites, Course 220 or equivalent, and consent of instructor. Lectures, T 10:10. Recitation to be arranged. Laboratory, T and F 2–4:25. Morrison 174 and 167. Associate Professor R. W. Bratton.

The application of principles of physiology and genetics in the breeding of farm livestock artificially so as to maximize genetic improvement of those traits of economic importance. The laboratories will provide opportunity for students to obtain experience in the techniques relevant to both the male and the female aspects of artificial insemination of large farm animals, and to study the physiological, genetical and economic problems relevant to the further improvement of livestock through the application of artificial insemination.

440. ADVANCED REPRODUCTIVE PHYSIOLOGY

To be taught one term each year by a visiting professor. Credit three hours. M W F 10:10. Consult Professor Hansel for details.

Subjects may include neuroendocrinology, biochemistry related to reproductive physiology or biochemistry of the gametes depending on the qualification of the visiting professor.

520. EXPERIMENTAL METHODS IN QUANTITATIVE GENETICS AND ANIMAL BREEDING

Fall term. Credit three hours. Prerequisite, Plant Breeding 514 or a course in mathematical statistics. Time and place to be arranged. Professor Henderson.

Estimation of genetic and environmental parameters required to design efficient selection programs. Particular emphasis is given to interpretation of experimental and survey data with unequal subclass numbers and to prediction of genetic progress resulting from alternative selection methods.

610. SEMINAR IN ANIMAL REPRODUCTION AND ENDOCRINOLOGY

Spring term. No credit. Open to graduate students with majors or minors in animal physiology. Th 4:30. Morrison 342.

620. SEMINAR IN ANIMAL BREEDING

Fall or spring term. Credit one hour. Open to graduate students with major or minor in animal breeding. Time and place to be arranged.

MAMMALIAN PHYSIOLOGY (BIOLOGICAL SCIENCES 414)

COMPARATIVE PHYSIOLOGY OF REPRODUCTION OF VERTEBRATES (POULTRY SCIENCE 425)

Animal Nutrition

112. LIVESTOCK NUTRITION (S and U optional)

Fall or spring term. Credit four hours. Prerequisite, Chemistry 103, 107, or Biological Sciences 131. Lectures: fall term, M W F 11:15, Morrison 163; spring term, M W F 9:95, Morrison 146. Laboratory: fall term, Th or F 2–4:25; spring term, M W Th or F 2–4:25. Morrison 164. Fall term, Associate Professor Pond; spring term, Professor S. E. Smith.

An introductory course in animal nutrition, covering fundamentals of nutrition, the composition of feeds, feeding standards and their application to various forms of production in dairy and beef cattle, sheep, swine, and horses.

311. THE PRINCIPLES AND PRACTICE OF ANIMAL FEEDING

Spring term. Credit three hours. Given primarily for students in the Veterinary College. Lectures, M W 8. Morrison 163. Laboratory, T 10:10–12:30. Morrison 164. Associate Professor Hogue.

Consideration is given to the basic principles of animal nutrition, nutritive requirements for various body functions; the identification, composition, and nutritive value of feeds, and the formulation of animal rations. The species covered include dairy cattle, beef cattle, sheep, swine, and horses, and there will be some consideration of dogs, cats, and other small animals.

410. PRINCIPLES OF ANIMAL NUTRITION

Fall term. Credit three or four hours. Prerequisites, a course in human or veterinary physiology, and a course in organic chemistry or biochemistry, or permission of the instructor. Lectures, M W F 10:10. Laboratory, optional, S 8–11:00. Morrison 342. Professor Loosli, Associate Professor Nesheim, Assistant Professor Hintz.

The chemistry and physiology of nutrition and the comparative nutritive requirements for maintenance, growth, reproduction, egg production and lactation.

510. SPECIAL TOPICS IN ANIMAL NUTRITION

Fall term. Credit one hour. Registration by permission. Time to be arranged. Morrison 342. Professor S. E. Smith and staff.

A discussion of selected advanced topics in animal nutrition.

511. LABORATORY WORK IN ANIMAL NUTRITION (S and U optional)

Fall term. Credit three hours. Prerequisites, quantitative analysis and Course 410, or its equivalent, or permission of the instructor. Laboratory, M W F 2–4:25. Morrison 342 and 443. Professor Warner.

Each student engages in a series of short research projects with experimental animals, such as rats and sheep. Both classical and modern techniques of animal experimentation are considered. The applications of biochemical methods to the solution of animal nutrition problems are stressed.

619. SEMINAR IN ANIMAL NUTRITION

Fall term. Credit one hour. Open to graduate students with major or minor field of study in animal nutrition. Registration by permission. M 4:30. Morrison 348. Animal Nutrition staff.

A critical review of the literature and other topics of special interest to graduate students in animal nutrition.

Advanced Nutrition

A series of nutrition courses offered jointly by the Department of Food and Nutrition, College of Home Economics; Department of Animal Science, College of Agriculture; Department of Poultry Science, College of Agriculture; and the Graduate School of Nutrition.

Prerequisites: courses in nutrition, physiology and biochemistry to include intermediary metabolism, or with permission of instructor.

The biochemical and physiological bases of digestion, absorption, transport and metabolism of nutrients; species differences where applicable; historical as well as current concepts of nutrition.

PROTEINS AND AMINO ACIDS (FOOD AND NUTRITION 501)

Fall term. Credit two hours. M W 10:10. Martha Van Rensselaer 339. Associate Professor M. A. Morrison.

LIPIDS AND CARBOHYDRATES (POULTRY SCIENCE 502)

503. NUTRITIONAL ENERGETICS

Spring term. Credit two hours. M W 10:10. Morrison 342. Professor Reid.

MINERALS AND VITAMINS (POULTRY SCIENCE 504)

Departmental Research and Seminars

395. UNDERGRADUATE RESEARCH

Fall and spring terms. Credit one to three hours, depending upon the problem undertaken and extent and quality of work done. Undergraduates must attach to their preregistration material, written permission from the staff member who will supervise the work and assign the grade. Open only to juniors and seniors of high scholastic ability with grade averages of 2.7 or above.

Designed to afford opportunities for outstanding undergraduates who plan to go to graduate school to carry out independent studies of suitable research problems under appropriate supervision. Each student will be expected to make a review of the literature, prepare a project outline, conduct the research, and write a summary report.

402. UNDERGRADUATE SEMINAR (S and U optional)

Spring term. Credit one hour. Limited to advanced undergraduates interested in animal husbandry. Hour to be arranged. Morrison 348. Staff.

A study of the pertinent literature of special topics in animal science. Students will be required to review current literature and to present oral and written reports.

500. RESEARCH

Fall and spring terms. Credit and hours by arrangement. All members of departmental staff.

601. SEMINAR

Fall and spring terms. Credit one hour. Required of all graduate students taking either a major or a minor subject in animal science. M 11:15. Morrison 348. Staff.

BIOLOGICAL SCIENCES

Students will be provisionally accepted in the biological sciences specialization as established by the Division of Biological Sciences during their freshman year or the first term of the sophomore year. Final admission to the specialization will require completion of (1) a year of biology (Course 101–102 or 103–104); (2) a year of general chemistry (preferably Chemistry 107–108); and (3) a year of calculus (Mathematics 111–112 or 111–122 or 107–108). Whenever possible, the student should include the above three subjects in his freshman schedule and complete organic chemistry and genetics in the sophomore year. It is also advisable for students anticipating a concentration in biochemistry or physiology to complete Physics 207–208 in the sophomore year, and all students should consider doing so. A student is not encouraged to undertake a specialization in biological sciences unless his performance in the above courses gives evidence of capacity to do satisfactory work at a more advanced level.

In addition to the introductory courses in chemistry, biological sciences, and mathematics, each specializing student must complete the following: (1) Chemistry 353–355 (or 355–356 and 357–358); (2) a year of physics (preferably physics 207–208, but 101–102 is also accepted); (3) Course 281 (Genetics); (4) Course 431 (or 531–532) (Biochemistry); (5) the breadth requirement outlined below; (6) one of the concentration areas outlined below; and (7) a minimum

of six hours of college credit in French, German, or Russian (other languages may be substituted only with special permission). The six hours may be satisfied by Advance Standing but not by Advanced Placement. The practice requirement is 13 units of appropriate experience of a professional nature.

The breadth requirement is designed to insure that each major student becomes familiar with a minimum number of different aspects of modern biology. In fulfillment of this requirement, each student must pass one of the listed courses in two of the following eight categories: (1) *Neurobiology and Behavior:* Courses 320, 421; *Psychology* 201, 323. (2) *Developmental Biology:* Courses 347, 385. (3) *Ecology and Evolution:* Courses 361, 475. (4) *Microbiology:* Course 290A. (5) *Morphology:* Courses 311, 313, 316, 345. (6) *Physical Science and Mathematics:* Chemistry 236, 389; Geology 101; Mathematics 213 or 221; Statistics 410. (7) *Physiology:* Courses 240, 410, 414. (8) *Taxon-oriented Courses:* 270, 316, 371, 344; Entomology 212; Plant Pathology 309.

The concentration requirement is designed to help the student achieve depth in some area of biology of his own choosing. It permits maximum flexibility, while insuring that the selection of advanced courses will form a coherent and meaningful unit. The student should seek the advice of his adviser in selecting the courses he will take in fulfillment of both the breadth and concentration requirements. The possible concentration areas are:

(1) *Animal Physiology and Anatomy:* Twelve hours, usually selected from the following: Courses 311, 313, 316, 385, 410, 410A, 412, 414, 419, 512. Animal Science 427–428; Poultry Science 425, 520; Veterinary Medicine 924.

(2) *Neurobiology and Behavior:* Course 320 and eleven hours to be selected in consultation with the adviser.

(3) *Biochemistry:* The student must fulfill the organic chemistry and biochemistry core requirements by taking Chemistry 355, 356, 357, 358 and Biological Sciences 431 (or 531–532). Chemistry 236 must be taken under the breadth requirement unless Chemistry 116 was taken. In addition, the student should take Chemistry 287–288 (or 279, 389–390) and Biological Sciences 432 (or 533).

(4) *Botany:* Usually Courses 240, 371, 345 and 347 (two of these may be selected under the breadth requirement).

(5) *Ecology and Evolution:* At least 14 hours, selected in consultation with an adviser. A course in introductory ecology, a course in systematics, and a course in physiology must be included here or under the breadth requirement.

(6) *Genetics and Development:* Nine hours, usually selected from the following: Courses 280, 347, 385, 440, 475, 482, 495, 495A, 584, 586, Statistics 410, Plant Breeding 515.

(7) *Microbiology:* Course 290, which may be selected under the breadth requirement, plus 12 hours in courses in basic microbiology, including at least two with a laboratory (such as 390B, 490B, 495B, Veterinary Medicine 340).

Students who, for good reason, wish to undertake a course of studies not covered by these seven concentration areas may petition for permission to do so.

Students interested in teaching biology in secondary schools may specialize in Biological Sciences for the B.S. degree and then complete the requirements for the M.A.T. (Master of Arts in Teaching) degree during a fifth year in the Graduate Field of Education. The fifth year includes one semester of graduate study in the sciences, a summer of preparation for teaching, and one semester of internship in a secondary school. Stipends and fellowship support

are available to selected candidates in the fifth year. Students interested in the five-year program leading to secondary school teaching are urged to consult their adviser and an adviser in the Department of Education during their freshman year.

An Honors program offers the superior student an opportunity to do independent work under the supervision of a member of the Division. This usually entails independent laboratory work on a project in addition to writing a thesis. Candidates for this program must be doing superior work in the sciences and obtain a sponsor within the Division. An Honors candidate may enroll in research courses offered by his sponsor. No more than four credit hours of research courses can be used for completion of the requirements in the area of concentration. Recommendation to the faculty that a candidate graduate with Honors will be the responsibility of the Honors Program Committee. Students interested should consult their adviser for further details, preferably during the first term of the junior year.

Registration for the Honors program can be no later than the first term of the senior year.

General Courses

101–102. BIOLOGICAL SCIENCE

Fall and spring terms. Credit three hours a term. Course 101 is prerequisite to Course 102, unless special permission is obtained from the instructor. 101–102 cannot be taken for credit after 103–104. Lectures, M W 8, or M W 10:10. Ives 120. Laboratory, M T W Th or F 1:30–4:25, or Th F or S 8–11, or T Th or F 10:10–1:00, or S 9:05–11:55, or M T W 7:30–10:20 P.M. Roberts 392. Two preliminary examinations will be given each term at 7:30 in the evening. Associate Professor Keeton, Assistant Professors Ambrose and Camhi, Mr. Zollinhofer, guest lecturers, and assistants.

Designed both for students who intend to specialize in biological sciences and for those specializing in other subjects, such as the social sciences or humanities, who want to obtain a thorough knowledge of biology as part of their general education. Plant and animal materials are considered together rather than in separate units. The fall semester covers cellular biology, the biochemistry of metabolism, physiology and anatomy, and behavior. The spring semester includes genetics, developmental biology, evolutionary theory, the biology of populations and communities, the origin of life, and evolutionary patterns in the plant and animal kingdoms. Each topic is considered in the light of modern evolutionary theory.

The course will include a series of lectures by guests who are outstanding faculty members of the University, lecturing on their own field of research. The intent is to acquaint students with the excitement and promise of modern biological research, both basic and applied, and, more particularly, with the research being done at Cornell.

103–104. PLANT AND ANIMAL BIOLOGY

Fall and spring terms. Credit three hours a term. Limited to 500 students. Certain students in Agriculture may take Course 106 instead of Course 104, but this substitution does not fulfill the requirement for admission to a Biological Science major. 103–104 cannot be taken for credit after 101–102. Course 103 is prerequisite to 104 unless special permission is obtained from instructor. Lectures, T Th 9:05 or 11:15. Fall term, Plant Science 233; spring term, Stimson G25. Laboratory, M T W Th or F 1:25–4:25, or M or T 10:10–1:10, or S 8–11 or 10:10–1:10. Stimson 102, 104, 107, 116. Two preliminary

examinations will be given each term at 7:30 in the evening; the dates are: October 21 and December 2, 1969, and March 9 and April 22, 1970. Fall term, Professor Banks; spring term, Professor Leonard.

Designed to give students an understanding of the growth, development and evolution of plants and animals and their role in nature. This integrated course provides the basic knowledge necessary for those who intend to specialize in some aspect of plant or animal sciences.

Plant biology (fall term) emphasizes the dynamic aspects of plant function, structure, growth and evolution. In laboratory, emphasis is placed on experimentation and analysis of living material. One period is devoted to field work. Biological principles are developed from a firsthand study of specific organisms and their function and interrelationships.

Animal biology (spring term) deals with the functional aspects of organ systems of animals beginning with the more familiar forms which serve as a point of reference. Material will include an introduction to the biochemical features of metabolism and regulatory control. Representatives of the major phyla will be used to illustrate biological principles.

106. INTERMEDIATE PLANT BIOLOGY

Spring term. Credit three hours. No specific prerequisite, but most students will have had at least Course 103 or its equivalent. Lectures, T Th 9:05. Plant Science 233. Laboratory, M T or W 1:25–4:25. Plant Science 107. Professor Banks.

Designed to provide a basic understanding of the structure, function, reproduction, and relationships of representatives from diverse plant groups. Intended for those who intend to specialize in some aspect of the plant sciences. Wherever possible students will be involved in the field collection of their own laboratory materials. Students will be encouraged to carry out a project of their own choice, possibly in collaboration with staff members in Botany or in allied plant science departments.

301. LABORATORY METHODS IN BIOLOGY

Fall or spring term. Credit three hours. Prerequisites, Courses 101–102 or 103–104. Limited to juniors, seniors, and graduate students; 20 students per section. Lecture-laboratory, T or F 10:10–12:35. Additional periods by appointment. Roberts 302. Professor Uhler.

For students who intend to teach or to follow some phase of biology as a profession. Subjects covered: collection, preservation, and storage of materials; the preparation of bird and mammal study skins; injection of circulatory systems with latex; clearing and staining of small vertebrates; and the preparation and staining of smears, whole mounts, and sections.

MATHEMATICAL AND STATISTICAL MODELS IN BIOLOGY (STATISTICS AND BIOMETRY 410)

401. TEACHING BIOLOGY

Fall or spring term. Credit four hours. Prerequisite, permission to register. Enrollment limited. Hours to be arranged. Assistant Professor Camhi.

Discussions of recent developments in the teaching of biology, and participation in teaching elementary biology at the college level.

409. RESEARCH IN BIOLOGY

Fall or spring term. Credit and hours to be arranged. Undergraduates must attach to their preregistration material, written permission from the staff member who will supervise the work and assign the grade. Staff.

Practice in planning, conducting, and reporting independent laboratory and/or library research programs.

600. SEMINAR: CURRENT TOPICS IN MODERN BIOLOGY (S and U optional)

Fall and spring terms. Credit one hour per topic (two topics per term). Open to juniors and seniors in the Division of Biological Sciences upon consent of instructors. Warren 232. Staff.

For each topic, a group of selected papers from the literature will be critically evaluated during six or seven two-hour meetings (probably held in the evening). Topics may include control mechanisms, protein structure, behavior, immunochemistry, molecular genetics, membranes, developmental genetics and photosynthesis. If you are interested, attend an organizational meeting Monday, September 15, at 12:20 P.M. in 345 Warren. Do not register for Course 600 before attending this meeting.

602. SEMINAR FOR M.S.T. DEGREE CANDIDATES

Spring term. Credit one hour. Hours to be arranged. Professor Uhler.

Discussion and evaluation of new approaches to biological instruction.

Animal Physiology and Anatomy

210. HUMAN PHYSIOLOGY

Spring term. Credit three hours. No credit for majors in Biological Sciences. Prerequisites, Chemistry 103 or equivalent; students must at least have taken high school courses in biology and chemistry. Lectures, M W F 8. Morrison 146. Staff.

Basic concepts of human anatomy and physiology will be presented to provide the groundwork for the understanding of the functioning of the human body in health and disease. Emphasis will be placed on the relationship of human physiology to problems of public health and contemporary living. The individual systems, such as cardiovascular, gastrointestinal, neurological, endocrine, renal, etc., will be discussed singly and in correlation with each other. Guest lecturers will be invited as appropriate.

311. COMPARATIVE ANATOMY OF VERTEBRATES

Fall term. Credit four hours. Prerequisites, Course 101–102, or 103–104. Lectures, to be arranged. Stimson G25. Laboratory, M F or T Th 1:25–4:25, or T Th S 8–11, or W 1:25 and S 8–11. Stimson 310. Staff.

Dissections and demonstrations of representative vertebrate types, including fish, amphibian, reptile, bird, and mammal. Intended to give students an appreciation of man's structural heritage and some insight into the interrelationship of form and function among the vertebrates.

313. HISTOLOGY: THE BIOLOGY OF THE TISSUES

Fall term. Credit four hours. Prerequisites, a two-semester introductory biology sequence; comparative anatomy and organic chemistry or biochemistry desirable. Lectures, T Th 11:15. Stimson G1. Laboratory, T Th 8–9:55, or 2:30–4:25. Stimson 206. Professor Wimsatt.

A general course dealing with the biology of the tissues to provide the student with a basis for understanding the microscopic and fine structural organization of vertebrates and the methods of analytic morphology at the cell and tissue levels. The dynamic interrelations of structure, chemical composition and function in cells and tissues are stressed.

316. INVERTEBRATE ZOOLOGY

Spring term. Credit four hours. Prerequisite, at least one year of biological science or permission of instructor. Two lectures and two laboratories per week. Lectures, W F 11:15. Stimson 105. Laboratory, W F 2:30–4:25. Stimson 225. Professor Anderson.

Lectures on selected topics in the development, structure, function, and interrelations of invertebrate animals, with particular attention to phylogenetic aspects. Intensive laboratory work in representative invertebrates, utilizing living or fresh specimens wherever possible. A significant amount of independent work is required of each student, including reports on library research.

ANIMAL EMBRYOLOGY (COURSE 385)

INSECT MORPHOLOGY AND HISTOLOGY (ENTOMOLOGY 322)

VERTEBRATE MORPHOLOGY (VETERINARY MEDICINE 900)

410. GENERAL ANIMAL PHYSIOLOGY, LECTURES

Spring term. Credit three hours. Prerequisites, one year of biology and courses in chemistry, organic chemistry, physics and biochemistry desirable. Lectures, M W F 10:10. Stimson G25. Assistant Professor Howland.

The principles of animal physiology are developed through consideration of the functioning of cells, tissues and organs. Specific topics discussed include respiration, metabolism, circulation, excretion, chemical integration, muscle contraction, nerve action and sensory reception.

410A. GENERAL ANIMAL PHYSIOLOGY, LABORATORY

Spring term. Credit one hour. Prerequisites, Course 410 or equivalent must be taken concurrently. Lecture, W 2, alternate weeks only. Stimson G25. Laboratory, T 8–11 or M T Th or F 1:25–4:25, alternate weeks. Stimson 306. Assistant Professor Howland.

Students are introduced to basic techniques utilized in the study of the physiology of animal tissues. Experiments cover topics dealing with respiration, properties of muscle, circulation, activity of nerves and osmotic phenomena.

[412. SPECIAL HISTOLOGY: THE BIOLOGY OF THE ORGANS

Spring term. Credit four hours. Given in alternate years. Prerequisites, Course 313, or consent of instructor. Enrollment limited to 18 students. Lectures, W F 9:05. Stimson 105. Laboratory, W F 2–4:25. Stimson 206. Professor Wimsatt.] Not given in 1969–70.

A continuation of Course 313. The microscopic and ultrastructural organization of the principal vertebrate organ systems are studied in relation to their development, functional interaction and special physiological roles. Courses 313 and 412 together present the fundamental aspects of the microscopic and submicroscopic organization of the vertebrate body from a physiological perspective. The organization of the course involves student participation in "lecture-seminars," and the prosecution of independent project work supplementary to the regular work of the laboratory. The latter enables students to gain practical experience with histological and histochemical preparative techniques.

FUNDAMENTALS OF ENDOCRINOLOGY (ANIMAL SCIENCE 427–428)

COMPARATIVE PHYSIOLOGY OF REPRODUCTION OF VERTEBRATES (POULTRY SCIENCE 425)

414. MAMMALIAN PHYSIOLOGY

Spring term. Credit six hours. Registration by permission. Prerequisite, a year of biological sciences. Courses in biochemistry, histology, and gross anatomy desirable. Lectures, M W F 8. Morrison 167. Discussion, S 10:10. Morrison 167. Laboratory, M or W 1:25. Morrison 174. Professors Gasteiger, Hansel and Visek (in charge), and Associate Professor Bensadoun.

A general course in mammalian physiology including circulation, respiration, digestion, metabolism, renal function, endocrinology, and the nervous system.

419. RESEARCH IN ANIMAL PHYSIOLOGY AND ANATOMY

Fall or spring term. Credit and hours to be arranged. Undergraduates must attach to their preregistration material, written permission from the staff member who will supervise the work and assign the grade. Staff.

Practice in planning, conducting, and reporting independent laboratory and/or library research programs.

SENSORY FUNCTION (COURSES 427, 428)

[512. COMPARATIVE PHYSIOLOGY

Spring term. Credit four hours. Prerequisites, Course 413 or 414 and biochemistry or the equivalent.] Not given in 1969–70.

A comparison of the principal physiological functions of vertebrates and invertebrates, with emphasis on their adaptations to different environmental conditions.

513. EXPERIMENTAL ENDOCRINOLOGY

Fall term. Credit two or three hours. Primarily for graduate students, open to undergraduates for two credits. Prerequisites, a year of zoology or its equivalent, organic chemistry, physiology and consent of instructor. Lectures, M F 11:15. Stimson G1. Laboratory, M or F 2–4:25. Stimson 306. Professor Leonard.

Lectures on the anatomy and physiology of the vertebrate endocrine glands, glandular interrelationships, mechanisms of hormone action, chemical and physiological properties of the hormones, assay methods. Laboratory includes small animal surgery, micro technique for the endocrines, illustrative experiments on the effects of hormones.

[516. SPECIAL TOPICS IN COMPARATIVE PHYSIOLOGY

Spring term. Credit and hours to be arranged. Prerequisites, consent of instructor. Enrollment limited. For advanced students in biological sciences. Associate Professor McFarland.] Not given in 1969–70.

Detailed consideration of selected topics in comparative physiology. Preparation of demonstration experiments stressing technique and individual research problems will be included. Topics vary from year to year.

GENERAL PHOTOBIOLOGY (COURSE 547)

ELEMENTS OF PHYSICAL BIOLOGY (VETERINARY MEDICINE 920)

Fall term. Credit three hours. Prerequisites, basic courses in chemistry, physics, biology, and calculus, or consent of the instructor. T Th F 11:15. Professor Comar and staff.

Lectures on atomic, molecular and cellular aspects of matter; physicochemical concepts in biology; membrane phenomena; mathematical approaches; compartmental analysis; tissue culture; informational macromolecules; biological coding and control.

Neurobiology and Behavior

320. NEUROBIOLOGY AND BEHAVIOR

Spring term. Credit three hours. Limited to juniors, seniors, and graduate students. Prerequisites, Courses 101–102 or 103–104. Lectures, T Th S 11:15. Plant Science 233. Professors Eisner (in charge), Gilbert, and O'Brien, Associate Professors Halpern, Salpeter, and Rosenblatt, and Assistant Professors Camhi, Emlen and Howland.

Evolution of behavior, cueing of behavior, social and non-social behavior, neuroanatomy, neurophysiology, neurochemistry, neural networks, memory.

327. BEHAVIORAL MATURATION (S and U Optional)

Fall term. Credit three hours. Prerequisite, introductory courses in college biology and psychology. Hours to be arranged. Professor Lenneberg.

Emergence of behavior will be studied in the light of developmental biology, including behavior genetics, neuroembryology and morphogenesis, physical maturation of the brain, transformation and allometry as well as retarding influences from the environment.

421. COMPARATIVE VERTEBRATE ETHOLOGY

Fall term. Credit three hours. Prerequisites, Courses 101–102 or 103–104, and 320, and permission of the instructor. Lectures, T Th 9:05. Rice 300. Laboratory, to be arranged. Associate Professor Dilger.

A survey of the methods and principles of vertebrate ethology for students specializing in this field or for those in other branches of zoology wishing to broaden their knowledge of animal behavior. Emphasis is placed on the causation, function, biological significance, and evolution of species-typical behavior. The laboratories are designed to give first-hand knowledge of the material covered in lectures.

PHYSIOLOGICAL PSYCHOLOGY (PSYCHOLOGY 323)

COMPARATIVE PSYCHOLOGY (PSYCHOLOGY 326)

424. BRAIN AND BEHAVIOR

Spring term. Credit three hours. Prerequisite, introductory courses in college biology and psychology, psychology 323 or equivalent. Hours to be arranged. Professor Lenneberg.

The first part is a theoretical introduction to human neurology for psychologists. This survey of clinical symptoms and their etiology is designed to enable students to make use of disease for research purposes. The second part is concerned with the characterization of models of brain function.

427. SENSORY FUNCTION

Fall term. Credit three hours. Prerequisite, Course 320 or the equivalent. Lectures, T Th 11:15. Warren 401. Discussion period to be arranged. Associate Professors Halpern and Tapper.

Sensory receptors and the central nervous system transformation of afferent activity will be considered in relation to human and animal psychophysical data and to the adaptive significance of behavior. The receptors will be examined in terms of anatomy, biochemistry, biophysics of transduction, and the central nervous system control of peripheral input. Information and signal detection theories will be applied.

427A. LABORATORY IN SENSORY FUNCTION

Fall term. Credit two hours. Prerequisite, Course 427. Enrollment limited to 15 students. Hours to be arranged. Associate Professors Halpern and Tapper.

429. RESEARCH IN NEUROBIOLOGY AND BEHAVIOR

Fall or spring term. Credit and hours to be arranged. Undergraduates must attach to their preregistration material, written permission from the staff member who will supervise the work and assign the grade. Staff.

Practice in planning, conducting, and reporting independent laboratory and/or library research programs.

521–522. BRAIN MECHANISMS AND MODELS

Throughout the year. Credit four hours a term. Prerequisites, calculus, introductory biology or psychology, and consent of the instructor; acquaintance with modern algebra and probability theory is desirable. Lecture, M W 7:30–9 P.M. Associate Professor Rosenblatt.

Fall term: review of fundamentals of neurophysiology; psychological and physiological criteria for brain models; computers and digital automata in relation to brain mechanisms; review of representative models; theory of elementary perceptrons. Spring term: theory of multilayer and cross-coupled perceptrons; recognition of temporal patterns; problems of figure organization, cognitive sets, sequential programs, and other problems of advanced models; contemporary theories of memory.

523. ECOLOGICAL ASPECTS OF ANIMAL BEHAVIOR

Fall term. Credit three hours. Prerequisites, Courses 320 and 361, and permission of instructor. Lectures, M W F 9:05. Warren 345. Assistant Professors Ambrose and Emlen.

A discussion of the interrelationships of animal behavior and ecology, with emphasis on the following topics: behavioral adaptations to the environment; ecological significance of diverse social systems; spatial relationships (habitat selection, homing, orientation, and navigation); role of social behavior in population regulation; evolution of altruistic behavior.

524. BEHAVIORAL NEUROPHYSIOLOGY

Spring term. Credit three hours. Prerequisite, Course 320 or equivalent. Lectures, T Th S 9:05. Bradfield 108. Assistant Professor Camhi.

A study of the relationship between animal behavior and the activity of individual nerve cells, considered empirically. Review of electrical properties of excitable tissue. Predictions from the study of animal behavior. Sensory coding of environmental energies. Principles of integration. Integration of sensory imputs. Neural control of muscle contraction. Correlating nerve activity and behavior, problems and prospects. Examples will be chosen from throughout the animal kingdom, with slight preference for invertebrate phyla.

524A. BEHAVIORAL NEUROPHYSIOLOGICAL LABORATORY

Spring term. Credit two hours. Course 524 must be taken concurrently. Enrollment limited to 15 students. Time and place to be announced. Assistant Professor Camhi.

Experiments in neurophysiology, often related to specific behavior patterns.

FUNCTIONAL ORGANIZATION OF THE NERVOUS SYSTEM (VETERINARY MEDICINE 924)

620. SEMINAR IN NEUROBIOLOGY AND BEHAVIOR

Fall or spring term. Credit one hour. Time to be arranged. Organizational meeting, first Monday of semester, 8 P.M. Comstock 245. Staff.

Fall topic, Animal Behavior; spring topic, Neurobiology.

622. SEMINAR IN ECOLOGICAL ANIMAL BEHAVIOR

Spring term. Credit one hour. Open to qualified graduate and undergraduate students who have taken courses in animal behavior and ecology, and who have secured permission of the instructor. Time to be arranged. Assistant Professor Ambrose.

Biochemistry

131. INTRODUCTORY AGRICULTURAL CHEMISTRY

Fall term. Credit five hours. Primarily for one-year students in Agriculture. Lectures, M T W Th 11:15. Recitation, Th 2–4:25. Riley-Robb 105. Associate Professor Neal.

Lectures, demonstrations, and recitations dealing with selected fundamental principles of inorganic, and biological chemistry. This course is not accepted as a prerequisite for further courses in chemistry or biochemistry.

231. INTRODUCTORY BIOCHEMISTRY

Fall term. Credit three hours. Prerequisite, Chemistry 104 or 108, or the equivalent. May not be taken for credit by students who have completed a more advanced course in this section. Lectures, T Th F 12:20. Stocking 218. Professor Williams.

A brief survey of organic chemistry as related to biological compounds and a discussion of selected biochemical topics and reactions associated with the metabolism of animals, plants, and microorganisms. Especially designed as a general course for four-year students in Agriculture.

431. PRINCIPLES OF BIOCHEMISTRY, LECTURES

Fall term. Credit four hours. Prerequisite, Organic Chemistry 353–355 or the equivalent. Lectures, M 8, Morrison 146; T Th S 8. Ives 120. Professor Daniel.

A basic course dealing with the chemistry of biological substances and their transformations in living organisms.

432. PRINCIPLES OF BIOCHEMISTRY, LABORATORY

Spring term. Credit three hours. Prerequisite, quantitative analysis or permission of the instructor. Course 431 or 532 must be taken concurrently. Laboratory, M W or T Th 2–4:25. Wing 106. Discussion period, M 1:25. Riley-Robb 105. Preliminary examinations on March 5 and April 9, 1970 will be held at 7:30 P.M. Associate Professor Neal and Assistant Professor Fessenden.

Laboratory practice with biochemical substances and experiments designed to illustrate basic biochemical principles and techniques.

439. RESEARCH IN BIOCHEMISTRY

Fall or spring term. Credit hours to be arranged. For undergraduate students concentrating in biochemistry. Prerequisite, adequate ability and training for the work proposed. Undergraduates must attach to their preregistration material, written permission from the staff member who will supervise the work and assign the grade. Staff.

Special work in any branch of biochemistry on problems under investigation by the staff of the section.

530. BIOCHEMISTRY OF THE VITAMINS

Spring term. Credit two hours. Given in alternate years. Prerequisites, Chemistry 353–355 and Course 431 or their equivalent. Lecture, T Th 10:10. Savage 100. Professor Daniel.

The chemical and biochemical aspects of the vitamins.

531–532. GENERAL BIOCHEMISTRY, LECTURES

Fall and spring terms. Credit four hours a term. Prerequisite, Chemistry 358, Physical Chemistry desirable. Lectures, M W F S 9:05. Riley-Robb 125.

An integrated treatment of the fundamentals of biochemistry. Fall semester: proteins, enzymes and the nature of enzymatic catalysis; carbohydrate metabolism; nitrogen metabolism. Assistant Professor Calvo and staff. Spring semester: energetics; lipid metabolism; biosynthesis of macromolecules. Associate Professor Guillory and staff.

533. GENERAL BIOCHEMISTRY, LABORATORY

Fall term. Credit three hours. Prerequisites, Chemistry 358 and 388 or 390. Must be taken with or following Course 531. Laboratory, T or Th 9:05–4:25. Wing 107. One discussion period to be arranged. First meeting for both sections will be held on the first Tuesday at 9:05. Professor Nelson and Assistant Professors McCarty and Wharton.

Selected experiments on carbohydrates, proteins, amino acids, and metabolism (cellular particulates, kinetics, general enzymology) will be given to illustrate basic biochemical principles. The course will emphasize the quantitative aspects rather than qualitative identifications.

536A. ADVANCED BIOCHEMICAL METHODS, LABORATORY

Spring term. Credit two hours. Prerequisite, Course 533. Graduate majors in biochemistry only. Hours to be arranged. Assistant Professor Keller and Associate Professor Wu.

Research techniques in biochemistry and molecular biology.

536B. ADVANCED BIOCHEMICAL RESEARCH

Spring term. Credit two hours. Prerequisite, Course 536A. Graduate majors in biochemistry only. Hours to be arranged. Professor Racker and staff.

Research work in the laboratory of staff members on a rotating basis.

537–538. ADVANCED BIOCHEMISTRY, LECTURES

Fall and spring terms. Credit one to three hours per term. Prerequisites, Courses 531 and 532 or permission of instructor. The course may be repeated for credit. Students may take one or more sections of the course, as each section can be taken without attending a preceding section. T Th 9:05. Savage 100. Staff.

This course will be comprised of advanced lectures in three of the following subjects per term (different subjects will be selected for different years): Carbohydrates and lipids, proteins and enzymes, biochemistry of membranes, mechanism of coenzyme function, mechanism of enzyme action, nucleic acids, protein synthesis, control mechanisms, bioenergetics, etc.

631–632. RESEARCH SEMINAR IN BIOCHEMISTRY

Fall and spring term. Credit one hour per term. M 8–9:30 P.M. Savage 100. Professor Racker.

Required of all graduate students (except first-year students) majoring in biochemistry. The course may be repeated for credit.

634. GRADUATE SEMINAR IN BIOCHEMISTRY

Spring term. Credit one hour. Prerequisites, Courses 531 and 532. Hours to be arranged. Savage 130. Staff.

Original publications in the areas of Course 537–5538 will be assigned to students for reporting and discussion.

639. BIOCHEMISTRY SEMINAR

Fall and spring terms. No credit. F 4:15. Riley-Robb 125. Staff.

Lectures on current research in biochemistry presented by distinguished visitors and staff.

Botany

240. PLANT PHYSIOLOGY

Spring term. Credit five hours. Primarily for undergraduates; open to graduate students without background in plant physiology. Prerequisites, Courses 101–102 or 103–104, and introductory chemistry. Prior or simultaneous course in organic chemistry is desirable. Lectures, T Th S 10:10. Plant Science 143. Conference, M T W Th or F 12:20–1:10. Room to be arranged. Laboratory, M T W Th or F 1:25–4:25. Plant Science 227. Professor Jagendorf, Assistant Professor Spanswick, and assistants.

The behavior, growth and environmental responses of plants; primarily, but not exclusively, high plants. Topics will include membrane properties, solute and water transport, the uses of osmotic forces; mineral nutrition; organic nutrition, growth characteristics, hormone action; light, gravitational and temperature responses; diurnal rhythms, photoperiod; saline, drought and freezing injury; respiration and photosynthesis.

EVOLUTION, TAXONOMY, AND ECOLOGY OF VASCULAR PLANTS (Courses 371, 464, 663)

344. BIOLOGY OF THE ALGAE

Spring term. Credit four hours. Lectures, M W F 11:15. Warren 131. Laboratory, M or F 2–4:25. Plant Science 202. Associate Professor Kingsbury.

An introduction to the freshwater and marine algae including consideration of their ecology as members of the plankton and benthos and their importance to man. The laboratory, utilizing field material and cultures from an extensive living collection, is designed to illustrate lecture topics, provide familiarity with algae in the field, and introduce the student to techniques used in isolating, culturing, and studying algae in the laboratory.

COMPARATIVE MORPHOLOGY OF FUNGI (PLANT PATHOLOGY 309)

345. PLANT ANATOMY

Fall term. Credit four hours. Prerequisites, Courses 101–102 or 103–104 and preregistration with instructor in charge. Lectures, T Th 8. Warren 145. Laboratory, T Th 10:10–12:35 or M W 2–4:25. Plant Science 211. Staff.

A detailed study of plant histology with equal emphasis on developmental aspects and mature structure.

347. CYTOLOGY

Fall term. Credit four hours. Prerequisite, Course 101–102 or 103–104 or the equivalent. Lectures, M W 9:05. Plant Science 143. Laboratory, M W or Th 10:10–12:35. Plant Science 219. Associate Professor Uhl.

A study primarily of the structure of cells and their components and the relation of these to function and to heredity. Special attention is given to chromosomes. Both plant and animal material are used.

349. PLANTS AND MAN (S and U optional)

Fall term. Credit three hours. Lectures and discussions, M W F 9:05. Warren 201. Assistant Professor Bates.

A consideration of the role of plants in the human environment and in the evolution of civilizations. Intended for students in all colleges. Emphasis is on ethnobotanical considerations and on historical to present-day utilization of plants in nutrition, housing, clothing, medicine, religion, and the arts.

440. CYTOGENETICS

Spring term. Credit three hours. Prerequisites, Courses 347 and 281 or the equivalent. Lectures, M W 9:05. Plant Science 143. Laboratory, M or W 10:10–12:35. Plant Science 219. Associate Professor Uhl.

An advanced course dealing mainly with the cellular mechanisms of heredity and including recent researches in cytology, cytogenetics, and cytotaxonomy.

[444. MORPHOLOGY OF LOWER VASCULAR PLANTS

Spring term. Credit four hours. Given in alternate years. Prerequisites, Course 345 and preregistration with instructor in charge. Lectures, M W 12:20. Plant Science 141. Laboratory, M W 2–4:25. Plant Science 211.] Not given in 1969–70.

An advanced course in the comparative morphology, life histories, and phylogeny of the nonseed bearing vascular plants, including consideration of structure, development and morphogenesis as applied to morphological interpretation.

[446. MORPHOLOGY OF HIGHER VASCULAR PLANTS

Spring term. Credit four hours. Given in alternate years. Prerequisites, Course 345 and preregistration with instructor in charge. Lectures, M W 12:20. Plant Science 141. Laboratory, M W 2–4:25. Plant Science 211.] Not given in 1969–70.

An advanced course in the comparative morphology, life histories, and phylogeny of the seed plants, including consideration of structure, development and morphogenesis as applied to morphological interpretation.

[448. PALEOBOTANY

Spring term. Professor Banks.] Not given in 1969–70.

449. RESEARCH IN BOTANY

Fall or spring term. Credit and hours to be arranged. Undergraduates must attach to their preregistration material written permission from the staff member who will supervise the work and assign the grade. Staff.

Students engaged in special problems or making special studies may register in this course. They must satisfy the instructor under whom the work is taken that their preparation warrants their choice of problem.

543. PLANT PHYSIOLOGY, ADVANCED LABORATORY TECHNIQUES

Fall term. Credit four hours. Primarily for graduate students doing work in plant physiology, but open to others if space permits. Prerequisites, organic chemistry, biochemistry, Course 240, or the equivalent. Preregistration recommended. Laboratory, T or W 8–5. Plant Science 241. Recitation, M 4:30–5:30. Room to be arranged. Staff.

An introduction to some modern methods in experimental plant biology.

[545. PHYSICAL APPROACHES TO PROBLEMS OF PHOTOSYNTHESIS

Fall term. Credit three hours. Given in alternate years. Prerequisites, Chemistry 104 or 108, Mathematics 112, Physics 208, or permission of the instructor. Lectures, M 1:25, T Th 10:10. Plant Science 141. Professor Clayton.] Not given in 1969–70.

Emphasis is on physical and photochemical mechanisms and physical experimental approaches. Photosynthetic organisms: their photochemical apparatus, metabolic pathways, and mechanisms for energy conversion. Descriptive introduction to the physics of excited states in molecules and molecular aggregates. Optical and photochemical properties of chlorophyll, and of the living photosynthetic tissue. Contemporary investigations of the photosynthetic mechanism. The level of the course can be judged by consulting "Molecular Physics in Photosynthesis", R. K. Clayton, Blaisdell Publishing Co., Waltham, 1965.

547. GENERAL PHOTOBIOLOGY

Fall term. Credit three hours. Given in alternate years. Prerequisites, same as for Course 545. Lectures, M 1:25, T Th 10:10. Plant Science 141. Professor Clayton.

A survey of systems of current interest in photobiology, including photosynthesis, bioluminescence, vision, photoperiodism, and the action of ultraviolet on nucleic acids. Physical concepts and methodologies are emphasized.

548. PLANT PHYSIOLOGY: ASPECTS OF METABOLISM

Spring term. Credit three hours. Given in alternate years. Prerequisites, Courses 240 and 431, Chemistry 353, or the equivalent. Lectures, M W F 9:05. Room to be arranged. Professor Jagendorf, Associate Professor Thompson, Assistant Professor McCarty and staff.

Selected areas of plant biochemistry will be reviewed in the context of the plant life cycle and responses to the environment. Probable topics include: metabolism and storage function of lipids, carbohydrates, organic acids, proteins and pigments; nitrogen and sulfur assimilation; hormone metabolism; respiration, photosynthesis, development and replication of mitocrondria and chloroplasts; cell wall composition and properties. Attention will be paid to operation of control mechanisms.

[549. PLANT PHYSIOLOGY: TRANSPORT PHENOMENA

Fall term. Credit three hours. Given in alternate years. Prerequisite, Course 240 or its equivalent. Lectures, M W Th 11:15. Plant Science 141. Assistant Professor Spanswick.] Not given in 1969–70.

An advanced course dealing with the transport of ions, water and organic materials in plants. Mechanisms of ion transport. Relationships between ion transport and metabolism. Ion uptake and transport in higher plants. Phloem transport. Water relations of single cells and whole plants. Water relations of crops and natural communities.

587. PERSPECTIVES IN PLANT PHYSIOLOGY: ADVANCED LECTURE SERIES (S and U optional)

Fall term. Credit two hours, or may be taken without credit. M W F 10:10. Plant Science 143. Professor Steward.

Primarily intended for graduate students, but open to qualified undergraduates. Review of salient topics in plant physiology, their present status, historical development and the problems they still present. Topics considered will change somewhat from year to year but will normally include some treatment of cell physiology, organic and inorganic nutrition, metabolism, growth and development.

PLANT ECOLOGY (COURSE 563)

ADVANCED MYCOLOGY (PLANT PATHOLOGY 569, 579, 589)

643. SEMINAR IN PLANT PHYSIOLOGY

Fall and spring terms. Credit one hour if requested. Required of graduate students taking work in plant physiology and open to all who are interested. F 11:15. Plant Science Seminar Room. Staff.

Reports on current research in plant physiology, by visitors, staff, or advanced graduate students.

645. CURRENT TOPICS IN PLANT PHYSIOLOGY

Fall and spring terms. Credit two hours per term. Course may be repeated for credit. Time and place to be arranged. Staff.

Seminar reports by graduate students, on current literature in experimental plant physiology or related areas.

647. SPECIAL TOPICS IN PLANT TAXONOMY

Fall and spring terms. Credit one hour per term. Prerequisite, permission to register. Lecture and discussion. Hours to be arranged. Mann Library 471. Professors Moore and Dress, Associate Professor Ingram, and Assistant Professor Bates.

A series of four topics, one presented each term, designed to provide professional background in biosystematics, literature of taxonomic botany, nomenclature, and tropical families of phanerograms.

A. *Families of Tropical Phanerogams.* Fall term 1969. The families of flowering plants encountered solely or chiefly in tropical regions will be considered in lectures, discussions and demonstrations with the aim of providing basic points of recognition for and an understanding of diversity and relationships in these families for the student venturing into the tropics. Professor Moore.

B. *Literature of Taxonomic Botany.* Spring term 1970. A survey of the basic reference works in taxonomy from the pre-Linnaean literature drawn on by Linnaeus to contemporary publications with comments on the peculiarities of the books (when appropriate), on publication dates, typographic devices and intricacies of bibliographic citation. Lectures, demonstrations, discussions, and problems. Associate Professor Ingram.

C. *Nomenclature.* Fall term 1970. An analysis of the International Code of Botanical Nomenclature and its application to various plant groups. Lectures, problems, discussion. Professor Dress.

D. *Biosystematics.* Spring term 1971. A consideration of biosystematic approaches to taxonomy, including chemical, numerical, cytological and statistical methodologies as well as a review of classic studies. Assistant Professor Bates.

CURRENT TOPICS IN MYCOLOGY (PLANT PATHOLOGY 649)

Ecology, Evolution, and Systematics

270. BIOLOGY OF THE VERTEBRATES

Spring term. Credit four hours. Prerequisite, Course 101–102 or 103–104. Lectures, M W 10:10. Savage 100. Laboratory, M W or T Th 2–4:25 or T Th 8–11. Fernow 14 and 16. Professor Cade.

An introduction to the evolution, classification, life history and ecology, and behavior of vertebrate animals. Laboratory and field work is concerned with structure, classification, taxonomic methods, biology of local species, and studies of selected aspects of vertebrate life, including food habits, activity cycles, behavior, and physiological adaptation.

INSECT BIOLOGY (ENTOMOLOGY 212)

INVERTEBRATE ZOOLOGY (COURSE 316)

361. GENERAL ECOLOGY

Fall or spring term. Credit three hours. Not open to freshmen. Prerequisite, Course 101–102 or 103–104 or the equivalent. Lectures, T Th 9:05. Bradfield 101. Discussion, W or Th 1:25, 2:30 or 3:35. Fall term, Assistant Professor Feeney; Spring term, Assistant Professor Root.

Principles concerning the interactions between organisms and their environment. Influence of competition, social behavior, predation, and other factors of population size and dispersion. Role of energy flow and mineral cycling in determining the structure and productivity of ecosystems. Succession and classification of natural communities. Influence of climate and past events on the diversity and stability of communities in different regions of the world. Interspecific competition and the niche concept. Chemical interactions between organisms. Application of ecological principles to human problems. Modern evolutionary theory will be stressed throughout and attention given to conflicting ecological hypotheses.

362. LABORATORY AND FIELD ECOLOGY

Fall term. Credit two hours. Prerequisite, permission of instructor. Enrollment limited. Laboratory, T Th 2–4:25. Stimson 225. Professor Cole and others.

A laboratory and field course to accompany or follow Course 361, for students who intend to concentrate in the area of ecology. This course will give the students a first-hand contact with ecological techniques.

SOIL MICROBIOLOGY (AGRONOMY 306)

INTRODUCTORY INSECT TAXONOMY (ENTOMOLOGY 331)

INTRODUCTORY PARASITOLOGY (ENTOMOLOGY 351)

BIOLOGY OF THE ALGAE (COURSE 344)

364. FIELD MARINE BIOLOGY (S and U optional)

Credit two hours. Prerequisite, a full year of college biology. A special course offered on Star Island, off Portsmouth, New Hampshire, June, 1970. Professors Anderson, Gilbert, Hewitt, and Raney, Associate Professors Barlow and Kingsbury (in charge), and guest lecturers.

Living material and habitats are emphasized in introducing students to the major disciplines of marine biology and in rounding out the student's knowledge of these topics as presented at inland locations. For more details, see the *Announcement of the Summer Session,* or consult Professor Kingsbury.

371. TAXONOMY OF VASCULAR PLANTS

Fall term. Credit four hours. Prerequisite, Course 281 or permission to register. Lectures and discussions, T Th 9:05. Plant Science 143. Laboratory, T Th 2–4:25. Mann 464. Professor Clausen.

An introduction to the evolution and classification of vascular plants, with attention to principles, methods of identification, and literature. In the first part of the term, trips are held in laboratory periods.

460. MARINE ECOLOGY

Spring term. Credit three hours. Prerequisites, Courses 361, 461, organic chemistry, and permission of the instructor. Enrollment limited. Lectures, M W F 10:10. Stocking 120. Associate Professor Barlow.

A consideration of the oceanographic aspects of the marine environment. For graduate students and advanced undergraduates. Lectures and seminars, with demonstrations and field trips to be arranged.

461. OCEANOGRAPHY

Fall term. Credit three hours. Prerequisites, college physics and chemistry; college mathematics desirable. Lectures, T Th 10:10. Stimson G–1. Additional lectures, Th 12:20 alternating with laboratory, M T or Th 2–4:30. Stimson 309. Associate Professor Barlow.

An introduction to general oceanography, designed to present a general description of the physical aspects of the oceans as a background for further studies in marine science. Laboratory, which will meet for about half the term, will be devoted to field demonstrations of equipment, analysis of some typical oceanographic observations, and work with simple models.

462. LIMNOLOGY

Spring term. Credit four hours. Prerequisites, Course 361, organic chemistry, and one year of college physics or permission of instructors. Lecture, W F 11:15. Plant Science 143. Laboratory, F 1:25–4:25, S 9–12. Stimson 309. Associate Professor Likens.

A study of processes and mechanisms in the biology, chemistry and physics of inland waters taught from a functional and analytic point of view. Laboratories devoted to both field studies and experiments on model systems.

462A. LIMNOLOGY, LECTURES

Spring term. Credit three hours. Prerequisites, Course 361, organic chemistry, and one year of college physics, or permission of instructors. Lecture, M W F 11:15. Plant Science 143. Associate Professor Likens.

The lecture portion of Course 462.

463. PLANT ECOLOGY

Fall term. Credit four hours. Prerequisite, Course 101–102 or 103–104 or equivalent. Lectures, M W F 10:10. Bradfield 105. Laboratory and field trips, T or F 2–5. Professor Whittaker and Assistant Professor Miller.

Principles of plant-environment interactions in relation to the distribution, structure and functioning of plant communities. These principles will be illustrated by analyzing in the field representative plant communities and their environments.

[464. EVOLUTION AND ECOLOGY OF VASCULAR PLANTS

Spring term. Credit four hours. Prerequisite, Course 341 or permission to register. Lectures and discussions, T Th 9:05. Plant Science 143. Laboratory, T Th 2–4:25. Mann 464. Professor Clausen.] Not given in 1969–70.

A study of the variation, evolution, and ecological distribution of vascular plants. Laboratory periods in the later part of the term are devoted to study of natural populations in the field.

AQUATIC ENTOMOLOGY AND LIMNOLOGY (ENTOMOLOGY 471)

469. BIOLOGY OF FISHES

Fall term. Credit four hours. Prerequisites, Course 101–102 or 103–104, or 270, or the equivalent. Lectures, M W 9:05. Room to be arranged. Laboratory, M W or T Th 2–4:25. Fernow 16. Professor Raney.

An introduction to the study of fishes; their structure, classification, evolution, distribution, ecology, physiology, and behavior. Laboratory studies on structure, identification, classification, and nomenclature. Field studies of local species.

[470. ICHTHYOLOGY

Fall term. Credit four hours. Given in even numbered years. Prerequisite, Course 469 or permission of instructor. Lectures, M W 9:05. Fernow 16. Laboratory, M W 2–4:30. Fernow 16. Professor Raney.] Not given in 1969–70.

Lectures on advanced aspects of the biology of fishes including systematics, ecology, life history, and literature. Laboratory studies of the orders, major families and principal genera, and of systematic procedures. Field studies of the ecology and life history of local species.

471. MAMMALOGY

Fall term. Credit four hours. Prerequisites, Course 270 or equivalent work in vertebrate biology and permission of instructor. Lectures, T Th 10:10. Rice 100. Laboratory, F 2:30–4:25, and S 9:05–11:30. Fernow 16. Associate Professor Hudson.

Lectures on the evolution, classification, distribution and adaptations, both physiological and morphological, of mammals. Laboratory and field work on ecology, behavior, physiology and the taxonomy of recent mammals, with emphasis on the North American fauna.

472. ORNITHOLOGY

Spring term. Credit four hours. Prerequisites, Course 270 or equivalent work in vertebrate biology and permission of instructor. Lectures, M W 11:15. Bradfield 108. Laboratory, W 2–4:30 and S 8–11. Assistant Professor Lancaster.

Lectures cover various aspects of the biology of birds, including anatomy, physiology, classification, evolution, migration and orientation, behavior, ecology and distribution. Laboratory will include studies of external and internal morphology, pterylosis, molts and plumages, skin identification of birds of New York and families of birds of the world. Several demonstration periods will emphasize hybridization, evolution, adaptive radiation, mimicry, and geographic variation. Field work includes identification of birds and familiarization of some techniques used in field research.

475. EVOLUTIONARY THEORY

Fall term. Credit four hours. Prerequisites, Course 281; a course with some taxonomic content in botany or zoology is desirable, or else some experience with making and maintaining a personal collection of some plant or animal

group. Lectures, T Th 11:15, Discussion, Th 12:20. Comstock 245. Professor W. L. Brown.

Lectures and class discussions on organic evolution, with primary emphasis on the mechanisms of speciation and adaptation. The course begins with a few lectures on taxonomic methodology.

479. RESEARCH IN ECOLOGY, EVOLUTION, AND SYSTEMATICS

Fall or spring term. Credit and hours to be arranged. Undergraduates must attach to their preregistration material, written permission from the staff member who will supervise the work and assign the grade. Staff.

Practice in planning, conducting, and reporting independent laboratory and/or library research programs.

ECOLOGICAL ASPECTS OF ANIMAL BEHAVIOR (Course 523)

561–562. QUANTITATIVE ECOLOGY

Throughout the year. Credit four hours a term. Given in alternate years. Prerequisites, one year of biology and permission of instructor. Organic chemistry and some college mathematics are desirable. Lectures, M W 11:15. Laboratory, W 1:25–4:25. Stimson 225. Professor Cole.

A quantitative course on selected ecological topics for advanced undergraduates and graduate students. Topics include the origin and interpretation of habitat differences, toleration and response physiology, population dynamics, construction and uses of life tables, spatial distribution patterns, and approaches to the quantitative analysis of biotic communities.

563. ADVANCED PLANT ECOLOGY

Spring term. Credit four hours. Prerequisite, Course 463. One course each in plant physiology and soils is strongly recommended. Lectures, M W F 10:10. Plant Science 143. Assistant Professor Miller.

Lectures and seminars dealing with the physiological mechanisms and the physical, chemical, and biological processes which underlie ecosystem structure and function. Some major topics included will be responses to the environment by individual plants, populations and species, and the cycling of energy, nutrients and water in ecosystems.

565. SPECIAL TOPICS IN LIMNOLOGY

Fall term. Credit three hours. Primarily for graduate students. Prerequisite, consent of instructor. Hours to be arranged. Associate Professor Likens.

A laboratory and seminar course. Advanced discussion and experimentation in specific topics in limnology. Content variable from year to year, but in general dealing with topics related to the production and metabolism of biological associations in inland water.

ADVANCED INSECT TAXONOMY (ENTOMOLOGY 531, 532, 533, 534)

ADVANCED PARASITOLOGY: PROTOZOA AND HELMINTHS (ENTOMOLOGY 551)

571. ADVANCED TOPICS IN VERTEBRATE BIOLOGY

Fall term. Credit two hours. Prerequisites, advanced courses in vertebrate biology and permission of instructors. Enrollment limited. Hours to be arranged. Professor Cade and Associate Professor Hudson.

Seminars on selected topics of vertebrate ecology, behavior, physiology, and systematics with an emphasis on review of current literature.

661. SEMINAR IN POPULATION AND COMMUNITY ECOLOGY

Fall term. Credit one hour. Course restricted to graduate students. Prerequisites, a course in ecology and permission of instructor. Lecture, M 7:30 P.M. Comstock 145. Assistant Professor Root.

The topic for 1969 will be the organization of natural communities. Participants will present reports on the evidence for recent theories advanced to explain the structure of food webs, the relative abundance of species, and the regulation of species diversity in communities. This course may be repeated for credit.

662. POPULATION ECOLOGY

Spring term. Credit three hours. Prerequisites, one course each in ecology and physiology and consent of instructor. Lectures, M W F 11:15. Plant Science 141. Professor Cole and Mr. Hall.

Critical examination of the properties and dynamics of populations. Emphasis on population theory, experimental approaches and analysis of natural populations.

663. SEMINAR IN EVOLUTION AND ECOLOGY OF VASCULAR PLANTS

Fall term. Credit one hour. Prerequisites, Course 464 and Statistics 510 and 511 or equivalent, or permission of instructor. Lecture and discussion, M 11:15. Mann 464. Professor Clausen.

A consideration of primary problems concerned with the classification, evolution, and environmental relationships of vascular plants.

665. ENVIRONMENTAL PHYSIOLOGY

Fall term. Credit three hours. Prerequisite, one course each in ecology and physiology and consent of instructor. Lectures, M W F 11:15. Plant Science 141. Associate Professor McFarland and Assistant Professor Miller.

Consideration of the responses of organisms to environmental variables. Emphasis on similarities and differences in molecular and organismal mechanisms by which plants and animals cope with their environments.

Genetics and Development

280. HUMAN GENETICS

Spring term. Credit three hours. Prerequisite, Course 101–102 or 103–104. Students who have had Course 281 may register only with the permission of the instructor. Lectures, M W 10:10. Riley-Robb 125. Discussion, F 10:10. Room to be arranged. Professor Srb.

An introduction to biological heredity through consideration of the genetics of man. Advances in the science of genetics are having a profound effect on man's understanding of himself and on his potential for influencing his present and future well-being. The course is intended primarily to contribute to the student's general education in these matters, and although certain aspects of genetics will be considered with some rigor, the course is not designed to serve as a prerequisite to advanced courses in genetics.

281. GENETICS

Fall or spring term. Credit four hours. Prerequisite, Course 101–102 or 103–104. Students who have had Course 280 may register only with the permission of the instructor. Lectures, M W F 8. Plant Science 233. Laboratory, M T W Th

or F 2:30–4:25, or T Th S 8–9:55. Plant Science 41. Students do not preregister for laboratory sections; laboratory assignments will be made at the end of the first lecture period. Professor Stinson, Assistant Professors Fink and MacIntyre and assistants.

A general study of the fundamental principles of genetics in eucaryotes, procaryotes, and viruses. Discussions of gene transmission, gene action and interaction, gene linkage and recombination, gene structure, gene and chromosome mutations, genetic aspects of differentiation, genes in populations, breeding systems, extrachromosomal inheritance. Animals, plants and microorganisms are used in the laboratory, which also includes an independent study of inheritance in *Drosophila*.

CYTOLOGY (COURSE 347)

385. ANIMAL EMBRYOLOGY

Fall term. Credit four hours. Prerequisite, Course 281. Lectures, M W F 9:05. Stimson G25. Laboratory, W 10:10–12:35 or 2–4:25 or F 10:10–12:35 or 2–4:25. Stimson 206. Associate Professor Blackler.

An introductory course in general animal embryology with major emphasis directed to vertebrates. The lectures cover the physiological, genetical and morphological bases of early development. The laboratories have a strong anatomical theme.

CYTOGENETICS (COURSE 440)

480. POPULATION GENETICS

Spring term. Credit three hours. Prerequisites, Course 281 or the equivalent and permission of instructor. Lectures, T Th 11:15. Plant Science 143. Professor B. Wallace.

A study of factors which influence the genetic structure of Mendelian populations and which are involved in race formation and speciation.

482. PHYSIOLOGICAL GENETICS

Spring term. Credit three hours. Prerequisites, Course 281 and a course in organic chemistry. Lectures, M W 8. Riley-Robb 125. Professor Srb.

The nature and activities of chromosomal and nonchromosomal genetic material are considered in relation to the functional attributes of organisms.

489. RESEARCH IN GENETICS AND DEVELOPMENT

Fall or spring term. Credit and hours to be arranged. Undergraduates must attach to their preregistration material, written permission from the staff member who will supervise the work and assign the grade. Staff.

Practice in planning, conducting, and reporting independent laboratory and/or library research programs.

584. EXPERIMENTAL EMBRYOLOGY, LECTURES

Spring term. Credit two hours. Prerequisite, Course 281. Lectures, T Th 11:15. Stimson G1. Associate Professor Blackler.

An advanced course in animal development in which the main emphasis is placed on developmental physiology and developmental genetics.

586. EXPERIMENTAL EMBRYOLOGY, LABORATORY

Spring term. Credit three hours. Prerequisites, Course 385 and permission of instructor. T Th 1:25–4:25. Enrollment strictly limited. Stimson 206. Associate Professor Blackler.

Students in this course will be able to work almost entirely with living material, and will be able to carry out some classical and modern experiments.

680. CURRENT TOPICS IN GENETICS

Throughout the year. Credit two hours a term. Open to graduate students, with preference given to majors in the field of genetics; undergraduates by permission only. No auditors. Enrollment limited to twenty students. Time and place to be arranged. Staff.

A seminar course with critical presentation and discussion by students of original research papers in a particular area of current interest. Content of the course and staff direction will vary from term to term, and will be announced a semester in advance.

Microbiology

290. GENERAL MICROBIOLOGY

Fall or spring term. Credit five hours. Prerequisites, Course 101–102 or 103–104 and Chemistry 104 or 108 or the equivalent. Lectures, M W F 11:15. Stocking 218. Laboratory, M W 2–4:25; T Th 8–11 or 2–4:25. Stocking 301, except spring term, M W section in Stocking 321. Fall term, Professor H. W. Seeley; spring term, Professor VanDemark.

A study of the basic principles and relationships in the field of microbiology, with fundamentals necessary to further work in the subject. The course offering in the spring term will provide special emphasis on the application of microbiology in home economics and agriculture.

290A. GENERAL MICROBIOLOGY, LECTURES

Fall or spring term. Credit three hours. Prerequisites, Course 101–102 or 103–104 and Chemistry 104 or 108 or the equivalent. Lectures, M W F 11:15. Stocking 218. Fall term, Professor H. W. Seeley; spring term, Professor VanDemark.

The same as the lecture part of Course 290. Will not serve alone as a prerequisite for advanced micriobiology courses.

290B. GENERAL MICROBIOLOGY, LABORATORY

Fall or spring term. Credit two hours. May be taken only by special permission of the instructor. Fall term, Professor H. W. Seeley; spring term, Professor VanDemark.

The same as the laboratory part of Course 290.

390A. ADVANCED BACTERIOLOGY LECTURE

Fall term. Credit three hours. Prerequisites, organic chemistry, Course 290 or permission of instructor, and biochemistry. Biochemistry may be taken concurrently. Lectures, T Th S 9:05. Stocking 119. Associate Professor MacDonald.

A study of the comparative physiological and ecological relationships among bacteria and some related organisms. A number of groups of bacteria will be discussed in detail as well as factors which influence their ability to survive in nature. In addition, a number of lectures will be devoted to the history of bacteriology and to the theory and development of bacterial classification.

390B. ADVANCED BACTERIOLOGY LABORATORY

Fall term. Credit three hours. Prerequisites, concurrent registration in 390A and permission of instructor. Limited enrollment. Preference given to those

students planning to register for Course 490B. Laboratory-lecture, M 1:25. Discussion, F 9:05. Stocking 321. Associate Professor MacDonald.

Techniques for the isolation, cultivation, and detailed study of selected groups of organisms. Some of the more standard techniques of physiological study will be introduced.

393. APPLIED AND INDUSTRIAL MICROBIOLOGY

Fall term. Credit three hours. Given in alternate years. Prerequisite, Course 290 or the equivalent. Lectures, T Th S 11:15. Stocking 119. Professors Delwiche, H. W. Seeley, VanDemark.

A survey of the microbiology of industrial fermentations, water, and waste decomposition.

394. DAIRY AND FOOD MICROBIOLOGY

Spring term. Credit four hours. Prerequisite, Course 290. Lectures, M W 12:20. Stocking 119. Laboratory, M W 2–4:25. Stocking 301. Professor Naylor.

The major families of microorganisms of importance in dairy and food science are studied systematically with emphasis on the role played by these organisms in food preservation, food fermentations, and public health. The laboratory work includes practice in the use of general and special methods for microbiological testing and control of dairy and food products as well as practice in the isolation and characterization of organisms found in foods.

SOIL MICROBIOLOGY (AGRONOMY 306)

PATHOGENIC BACTERIOLOGY (VETERINARY MEDICINE 340)

490A. MICROBIAL PHYSIOLOGY LECTURE

Spring term. Credit three hours. Prerequisite, Course 390 or permission of instructor. Lectures, T Th S 10:10. Stocking 119. Primarily for microbiology majors intending to enter graduate school and for graduate students. Assistant Professor Gibson and staff.

A study of the organization of physiological processes in microorganisms, including a study of structure, energy-yielding mechanisms, macromolecular biosynthesis and of growth and regulation.

490B. MICROBIAL PHYSIOLOGY LABORATORY

Spring term. Credit three hours. Prerequisites, a grade of B– or better in Course 390, coregistration in 490A and permission of the instructor. Time to be arranged. Stocking 321. Assistant Professor Gibson and staff.

Experiments on material covered in Course 490A will be used to introduce students to modern techniques used in physiological research, such as the use of radioisotopes, large-scale growth of microorganisms, and the isolation and characterization of specific cellular components.

495A. MICROBIAL GENETICS, LECTURES (S and U optional)

Fall term. Credit two hours. Prerequisites, Courses 281 and 290, or permission of the instructor. For upperclassmen and graduate students. Lecture, W 7:30–9:25 P.M. Stocking 218. Associate Professor Zahler.

Genetics of bacteria and their viruses, with emphasis on the mechanisms of genetic phenomena.

495B. MICROBIAL GENETICS, LABORATORY

Fall term. Credit three hours. Prerequisite or parallel, Course 495A. Permission of the instructor is required. Primarily for upperclassmen. Laboratory, T

1:25–4:25, and other hours to be arranged. Stocking 321. Associate Professor Zahler.

Laboratory methods in the genetics of bacteria and their viruses.

496. CHEMISTRY OF MICROBIAL PROCESSES

Spring term. Credit two hours. Prerequisites, beginning courses in general microbiology, biochemistry, and organic chemistry. Course intended for upperclassmen and graduate students. Lectures, M W 11:15. Stocking 119. Professor Delwiche.

Selected topics pertaining to the energy metabolism, oxidative and fermentative abilities, and biosynthetic capacities of microorganisms. Where possible and appropriate the subject matter deals with the various microbial forms in a comparative sense.

498. VIROLOGY

Spring term. Credit three hours. Given in alternate years. Prerequisites, Courses 290 and 281 and permission of the instructor. Lectures, T Th S 11:15. Stocking 218. Professor Naylor, assisted by Professor Ross and Associate Professor Carmichael.

A study of the basic physical, chemical, and biological properties of plant, animal and bacterial viruses.

499. RESEARCH IN MICROBIOLOGY

Fall or spring term. Credit and hours to be arranged. Undergraduates must attach to their preregistration material, written permission from the staff member who will supervise the work and assign the grade. Staff.

590. METHODS IN ADVANCED BACTERIOLOGY

Fall and spring term. Credit to be arranged. Primarily for graduate students. Prerequisite, permission of instructor. Limited enrollment. Hours to be arranged. Staff.

Intended to acquaint advanced students with some of the more important techniques used in the study of bacterial physiology. Emphasis will be placed on the use of radioisotopes; growth, structure and function of cells.

596. MOLECULAR IMMUNOLOGY

Spring term. Credit two hours. For advanced undergraduates and graduate students. Prerequisite, Biochemistry 531 or permission of the instructor. T Th 11:15. Place to be arranged. Assistant Professor Slobin.

A study of the immune response with particular emphasis on the structure and evolution of immunoglobulins, the nature of antigen-antibody interactions and the molecular biology of antibody biosynthesis.

ADVANCED SOIL MICROBIOLOGY (AGRONOMY 506)

SEROLOGY (VETERINARY MEDICINE 941)

IMMUNOCHEMISTRY (VETERINARY MEDICINE 944)

ANIMAL VIROLOGY (VETERINARY MEDICINE 945)

691. GRADUATE SEMINAR IN MICROBIOLOGY

Fall and spring terms. Credit one hour per term. Required of all graduate students majoring in microbiology. Time and place to be arranged. Staff.

699. MICROBIOLOGY SEMINAR

Fall and spring terms. Without credit. Required of graduate students majoring in microbiology and open to all who are interested. Th 4:15. Riley-Robb 105. Staff.

COMMUNICATION ARTS

This curriculum is based on a strong foundation in the sciences and humanities, which provides content and breadth needed for a specialty area such as communication arts. Beginning with the sophomore year communication courses are carefully integrated with those in other disciplines to offer majors intellectual, cultural, and social strengths for individual accomplishment. Prospective majors may get additional information directly from the department.

Communication Theory

200. THEORY OF HUMAN COMMUNICATION

Fall term. Credit three hours. Lecture, T Th 10:10. Discussion, T or Th 12:20. Warren 245. Staff.

Introduction to the basic theories of communication behavior and their implications for everyday communication situations. Students consider the results of research in communication and learn to relate these results to their own area of specialization.

Person-to-Person Communication

100. ORAL AND WRITTEN EXPRESSION

Fall term. Credit three hours. Not open to four-year students. M W F 8, 9:05; or T Th S 10:10. Warren 145. Conferences by appointment, daily 8–5, S 8–12. Mr. Lueder and assistants.

A program of speaking and writing designed to develop proficiency in clear and effective communication. Individual appointments are scheduled to counsel the students in principles of effective expression.

205. PARLIAMENTARY PROCEDURE

Fall or spring term. Credit one hour. Not open to freshmen. Th 11:15, Bradfield 108, or F 11:15, Plant Science 37. Professor Freeman, Associate Professor Martin and Mr. Lueder.

Principles and practice of parliamentary procedure including formation of constitution and by-laws. Programmed instructional materials used. Emphasis on experience in applying principles of parliamentary procedure in meeting situations.

301. ORAL COMMUNICATION

Fall or spring term. Credit three hours. Fall term limited to juniors and seniors; spring term open to sophomores, juniors, and seniors. Each section is limited to twenty students. Fall term: M W F 8 or 9:05, Warren 131; 10:10, Warren 231; or 11:15, Warren 245; or T Th 9:05 and W 12:20; or T Th 10:10 and W 12:20, Warren 131. Spring term: M W F 8 or 9:05, Warren 131; or 10:10,

Warren 260; or 11:15, Warren 231; or T Th 9:05 and W 12:20, Warren 131; or T Th 10:10 and W 12:20, Warren 345. Conferences daily 8–5, S 8–12. Professor Freeman, Associate Professor Martin, and Assistant Professors Campbell and Kemper.

Training and experience in the theory, preparation, presentation, and evaluation of oral topics. Designed to encourage interest in public affairs and to develop self confidence. Individual appointments are scheduled to counsel the students in principles of effective self-expression.

302. ADVANCED ORAL COMMUNICATION

Fall or spring term. Credit two hours. Prerequisite, Course 301. Fall term: T Th 11:15. Spring term: T Th 10:10, Warren 131 or W F 10:10, Warren 231. Conferences by appointment, daily 8–5, S 8–12. Professor Freeman, Associate Professor Martin, and Assistant Professor Campbell.

Students present a variety of talks of varying lengths with emphasis on persuasive, manuscript, and visual aid speeches. The theory of persuasion and audience analysis is stressed. Individual appointments are scheduled to counsel the students in principles of effective self-expression.

303. GROUP DISCUSSION

Spring term. Credit three hours. M W F 9:05. Warren 160. Assistant Professor Kemper.

Theory and practice in leadership and participation in small group communication. The course stresses learning and problem solving in the discussion setting.

Written Communication

215. INTRODUCTION TO MASS MEDIA

Spring term. Credit three hours. Limited to 190 students. M W F 11:15. Bradfield 101. Associate Professor Russell.

An introductory course which explores policies, philosophies, and practices of communication media. Special consideration is given to the style and technique used in preparing and presenting specialized informational material in newspapers, magazines, radio, and television. Freedom of the press, ethics, libel, and slander are considered in the day-to-day function of the media.

312. ADVERTISING AND PROMOTION

Fall term. Credit three hours. Limited to 190 students. M 1:25–4:25. Bradfield 101. Associate Professor Russell.

Examines advertising principles and techniques in both an historical and economic perspective. Advertising and promotion campaigns, trends, and their overall effectiveness as a multiplier in the economy are analyzed. The strategy of media planning, and insights into the actual thinking about advertising and within advertising, is introduced to show the student the relationship of the behavioral sciences to marketing and advertising activity.

313. WRITING FOR MAGAZINES

Spring term. Credit three hours. Open to juniors, seniors, and graduate students. M 1:25–4:25. Roberts 131. Professor Ward.

An intensive fact writing course to help students communicate more effectively through the medium of the printed word in magazines. Art and techniques of good writing studied; continuous analysis of magazines in many

fields of interest. All articles analyzed and returned to each student for rewriting and submission to a magazine.

315. NEWS WRITING AND ANALYSIS

Fall term. Credit three hours. M W F 8. Roberts 131. Assistant Professor Crawford.

The writing and analyzing of news stories. A study of press problems, press-society relations, the elements that make news, sources of news, interviewing, writing style and structure, and the reporting of public affairs.

316. SCIENCE WRITING

Spring term. Credit three hours. M W F 8. Roberts 131. Assistant Professor Crawford.

In-depth interpretation of scientific subjects for general publications. The translating of scientific language to the degree necessary for reaching various publics. Analysis of issues that arise in general reporting of the news of science. Previous writing courses and/or experience are strongly recommended.

Broadcasting Communication

220. RADIO BROADCASTING AND TELECASTING

Spring term. Credit three hours. M W F 9:05. Roberts 131. Associate Professor Kaiser.

An introductory course to familiarize students with the best methods of presenting ideas by radio and television. Practice includes preparing and presenting radio talks, continuity writing and program arrangements. A survey of the media and related problem areas is also covered.

422. TELEVISION PRODUCTION AND PROGRAMMING

Fall term. Credit two hours. Open to juniors, seniors, and graduate students. T 2:30–4:25. Roberts 131. Associate Professor Kaiser.

A survey of television as a means of getting information to the public. A study is made of the techniques employed in televising informational-type programs. Students prepare formats and scripts and present programs before a closed-circuit camera chain. Evaluation of criticism of the programs is made by the instructor and the class.

Communication History

214. HISTORY OF MASS COMMUNICATION

Spring term. Credit three hours. M W F 10:10. Warren 45. Assistant Professor Crawford.

A survey of the history of the print, film and broadcast media with particular emphasis on the United States. Includes an analysis of the sociological and technological factors influencing media development.

Communication Law

401. COMMUNICATION LAW

Spring term. Credit three hours. Enrollment limited to majors at the junior, senior, and graduate level, and others by permission. M W F 11:15. Roberts 131. Associate Professor Bugliari.

Consideration of the legal philosophy regarding media of communication, specifically concerning privileges and legal limitations in print and broadcast media (libel, slander, defamation, sedition, privilege, ethics, copyright, etc.).

Visual Communication

431. VISUAL COMMUNICATION

Fall term. Credit three hours. Open to juniors, seniors, and graduate students. M W F 10:10. Roberts 131. Associate Professor Stephen.

Explores the importance of graphic arts for communicating ideas in today's visually oriented society. Examines the principles of visual communication as related to message content and psychological impact. Still photography, slide sets, motion pictures, TV, posters, exhibits and other media are analyzed.

430. ART OF PUBLICATION

Spring term. Credit two hours. Open to juniors, seniors, and graduate students. W 1:25–3:30. Roberts 131. Associate Professor Stephen.

Designed to explore creative visual concepts to increase communication effectiveness through the printed word. Importance of selecting and coordinating format, layout, typography, and illustrations (with emphasis on photography) is stressed. Lectures, field trips, and assignments examine merits and problems in using publications as a communication medium.

International Communication

501. INTERNATIONAL COMMUNICATION

Spring term. Credit three hours. Open to graduate students. Seniors admitted by permission of instructor. T 1:25–4:25. East Roberts 223. Assistant Professor Colle.

An analysis of mass media around the world with emphasis on their structure and function as they relate to a nation's political, economic and social patterns. Attention is given to the forging of mass media systems in the developing. nations and to cross-national and satellite communications. Designed for both U.S. students and students from other countries.

524. COMMUNICATION IN THE DEVELOPING NATIONS

Fall term. Credit three hours. Prerequisite, Course 215, or permission of instructor. M W F 11:15. Warren 232. Assistant Professor Crawford.

An examination of existing communication patterns and systems and their contributions to the development process. Special attention is given to the interaction between communication development and national development in primarily agrarian societies.

Communication Seminars

521. PROSEMINAR IN U.S. COMMUNICATION SYSTEMS

Fall term. Credit three hours. Open to graduate students. Seniors admitted with prerequisite of Course 215. T 1:25–4:25. Plant Science 37. Assistant Professor Colle.

An examination of the structure of communications in the United States,

focusing particularly on the organization, content, controls, and audience of the print, broadcast and film media. Selected media of other nations are included in the analysis to provide a perspective on the U.S. system.

Research

495. UNDERGRADUATE RESEARCH

Fall and spring terms. Credit one to three hours. Open only to seniors majoring in the department, who must attach to their preregistration material written permission from the staff member who will supervise the work and assign the grade.

Designed to permit outstanding undergraduates to carry out independent studies in communications research under appropriate supervision. Departmental staff.

CONSERVATION

The Department of Conservation offers a wide variety of educational opportunity in the natural resources area. For undergraduates, there are sequences in fishery science, wildlife science, forest science, and outdoor recreation. For graduate students there are available as major subjects: fishery biology, wildlife science, natural resources conservation; and, as a minor subject, forest conservation. There may be emphasis in international studies in these subjects. The graduate minor in water resources may be taken in this department under Professors Eipper, Hamilton, or Oglesby.

Other areas of study in the natural resources field include programs in soil and water conservation in the Agronomy Department, conservation education in the Department of Education and resource economics in Agricultural Economics.

Natural Resources Conservation

110. CONSERVATION OF WILDLIFE

Spring term. Credit two hours. Lectures, T Th 10:10. Morrison 146. Assistant Professor McNeil.

An introduction to the wildlife resources and their interrelations with other resources; the importance of the flora and fauna in our economic and cultural life. Serves as an introductory course for conservation majors and is of general cultural and informational interest to students in other fields.

201. CONSERVATION OF NATURAL RESOURCES

Fall term. Credit two hours. Lectures, T Th 10:10. Morrison 146. Assistant Professor McNeil.

The natural resources situation and problems in the United States. A consideration of the soil, water, forest, wildlife, grassland, minerals, and recreational resources of the United States and their adequacy to meet the demands of an increasing population undergoing rapid urbanization. Current resource use conflicts.

420. OUTDOOR RECREATION

Fall term. Credit two hours. Prerequisite, Course 201 or permission of

instructor. T Th 11:15. Fernow Seminar Room. Assistant Professor Wilkins.

Factors involved in allocating natural resources for outdoor recreation are considered. Characteristics of public and private administration of recreation area are studied and trends in outdoor recreation explored.

510. PERSPECTIVES ON CONSERVATION

Fall term. Credit two hours. Primarily for graduate students but open to seniors. Th 2–4. Fernow Seminar Room. Assistant Professor Wilkins.

A seminar based upon extensive readings of articles highlighting varying philosophical approaches to the conservation of natural resources. Views espoused by developmentalists, preservationists, naturalists, economists, welfare economists, and urban planners will be considered.

511. INTERNATIONAL NATURE CONSERVANCY

Fall term. Credit two hours. T 3:35. Fernow 210. Professor Hamilton and Assistant Professor McNeil.

A seminar devoted to exploring international programs of nature conservancy; extinct and endangered species; floral and faunal protection in various countries; national park systems; protection vs. management; the relevance of United States experience; role of nature conservancy in resource development of emerging nations. Foreign students especially are invited.

602. SEMINAR IN NATURAL RESOURCES PLANNING AND DEVELOPMENT (S and U exclusive)

Spring term. Credit two hours. W 2:30. Fernow 212. Professor Hamilton.

An interdisciplinary graduate student seminar. Seminar theme varies from year to year to include such topics as: Small watershed planning, multiple use management, urban fringe problems, outdoor recreation, land use planning methods and river basin development. Field trips and invited resource specialists.

604. SEMINAR ON SELECTED TOPICS IN NATURAL RESOURCES CONSERVATION

Spring term. Credit one hour. Time to be arranged. Associate Professor Brumsted and staff.

Primarily for graduate students majoring or minoring in Natural Resources Conservation.

Forestry

302. FOREST ECOLOGY

Fall term. Credit three hours. Limited to 30 students. Lectures, M W 11:15. Laboratory, M 2–4:25. Fernow 210. Professor Hamilton.

Development of the ability to analyze what is present and what is happening in various forest ecosystems. All laboratory sessions in the field. One required weekend trip to the Adirondacks or other major forest region in New York or adjacent states.

303. WOODLOT MANAGEMENT

Fall term. Credit three hours. Lectures, M W 11:15. Laboratory, W 1:45–4:25. Rice 300. (Three field laboratories will end at 5:15 because of travel time.) Associate Professor Morrow.

Designed to give the student the basic information necessary to permit

sound woodland management decisions. Field trips to woodlots emphasize variations in value and potential as well as biological growth. Introduction to tree identification, log scaling, timber estimating, tree marking, and stand improvement work. Planting, management, harvesting, marketing, Christmas trees, maple sirup, and multiple use are discussed.

Fishery Biology

439. FISH ECOLOGY

Fall term. Credit three hours. Prerequisites, Biological Sciences 270 or permission of instructor. M W F 10:10. Bradfield 108. Assistant Professor Carlson.

Interactions between fishes and their living and non-living environment, and applications of ecological principles to fish population research and management.

Population ecology; interspecific relationships among fishes including competition, predation, parasitism, and commensalism; and relationships of fishes to other organisms. Adaptations, diversity of life history and behavior patterns, and usual inhabitants of major habitat types are considered. The ecology of young fishes is stressed, and the student is introduced to the literature of fishery biology.

440. FISHERY SCIENCE

Fall term. Credit three hours. Students other than majors in the Department of Conservation must have permission of instructor to register. M W F 12:20. Rice 300. Professor to be appointed.

Principles and theories involved in dynamics of fish populations. Methods of obtaining and evaluating statistics of growth, population size, mortality, yield, and production, as well as investigational aspects of fishery biology are included.

441. FISHERY RESOURCE MANAGEMENT

Spring term. Credit three hours. Prerequisites, Courses 439 and 440 or permission of instructor. Lectures, T Th 11:15. Fernow 210. Discussion to be arranged. Associate Professor Eipper.

Principles and problems in the management of freshwater and marine fishery resources, considered in relation to problems of human population and management of other natural resources.

Multiple use concepts, allocation problems, and the economic, legal, and political ingredients in solving those problems. Characteristics of fishery resources and their exploitation. Policies and techniques in managing fish stocks through maintenance and improvement of habitat, fish population manipulation, and regulation of fishing.

442. BASIC PRINCIPLES OF FISH CULTURE

Spring term. Credit two hours. Prerequisites, general zoology and a course in chemistry. A course in biochemistry or physiology is desirable. Lecture, M 12:20. Laboratory, M 2–4:25. Fernow 210. Associate Professor A. M. Phillips, Jr.

A study of the nutrition, metabolism, and physiology of hatchery fish and principles of hatchery management.

443. ECOLOGICAL ASPECTS OF WATER RESOURCES MANAGEMENT

Fall term. Credit three hours. Limited to 30 students. Seniors or graduate

students only. T Th 9:05, F 1:25–4:25. Bradfield 108. Associate Professor Oglesby.

Basic structural and dynamic aspects of freshwater and estuarine ecosystems are reviewed. The nature and modes of action of stresses imposed by man on these systems and their significance to management decisions are then studied. Students will become acquainted with some of the more important laboratory and field study tools.

600. SEMINAR: MAJOR FISHERY INVESTIGATIONS

Spring term. Credit one hour. Given in alternate years. Prerequisite, permission of instructor. W 12:20. Staff.

A comparative review of major fishery investigations of the world constitutes the primary content of seminar. A study of pertinent literature and special topics will be assigned.

601. SEMINAR ON SELECTED TOPICS IN FISHERY BIOLOGY

Fall or spring term. Credit one hour. Time to be arranged. Staff.

WILDLIFE SCIENCE

304. WILDLIFE ECOLOGY

Fall term. Credit two hours. Courses 401 and 402 may be taken concurrently or at a later date. W F 11:15. Bradfield 108. Assistant Professor Moen.

Consideration of the basic physical, physiological, interspecific, and intraspecific relationships between the organism and its environment.

401. WILDLIFE ECOLOGY: NUTRITION

Fall term. Credit one hour. Prerequisites, Course 304 (or concurrent registration), a course in physiology, or permission of instructor. Limited to ten students. M 1:25–4:30 and time to be arranged. Fernow 212 and Wildlife Laboratory. Assistant Professor Moen.

Field and laboratory exercises provide opportunities for student participation in analyzing animal-environment relationships.

402. WILDLIFE ECOLOGY: BEHAVIOR

Fall term. Credit one hour. Prerequisites, Course 304 (or concurrent registration), a course in physiology, or permission of instructor. Limited to ten students. W 1:25–4:30 and time to be arranged. Fernow 212 and Wildlife Laboratory. Assistant Professor Moen.

Field and laboratory exercises provide opportunities for student participation in analyzing animal-environment relationships.

406. WILDLIFE ECOLOGY: WINTER STRESS

Spring term. Credit one hour. Prerequisites, physics, Course 304, a course in physiology, or permission of instructor. Limited to ten students. M 1:25–4:30 and time to be arranged. Fernow 212 and Wildlife Laboratory. Assistant Professor Moen.

Field and laboratory exercises provide opportunities for student participation in analyzing animal-environment relationships.

410. PRINCIPLES OF WILDLIFE MANAGEMENT

Spring term. Credit three hours. Prerequisite, Course 201 or permission of the instructors. Lectures, M W F 11:15. Rice 300. Professor Hewitt, Associate Professor Brumsted and visiting lecturers.

Management of wildlife populations and wildlife habitats; wildlife resource policy and administration at national, state and local levels. Consideration of wildlife management for students with professional interest in this and other natural resources fields.

411. WILDLIFE MANAGEMENT LABORATORY

Fall term. Credit one hour. Prerequisite, Course 304 (or concurrent registration). F 1:25–4:30 and several all-day Saturday field trips. Fernow 212. Professor Hewitt.

Field methods in wildlife research and management, for wildlife majors.

412. ADVANCED WILDLIFE MANAGEMENT LABORATORY

Spring term. Credit one hour. Prerequisite, Course 304, and must be taken with Course 410. Laboratory, F 1:25–4:25. Fernow 212. Several all-day field trips. Professor Hewitt and Associate Professor Brumsted.

Practical methods in wildlife research and management. For seniors and graduate students majoring in wildlife science.

505. HABITAT ECOLOGY AND MANAGEMENT

Spring term. Credit one hour. Prerequisite, Course 304 or permission of instructor. Time to be arranged. Fernow 212. Associate Professor Thompson.

An analysis of the role of habitat manipulation in wildlife ecology and management. Field exercises will be included.

603. SEMINAR ON SELECTED TOPICS IN WILDLIFE SCIENCE

Credit one hour. Time to be arranged. Fall or spring term. Staff.

Research

Either term. Credit and hours to be arranged. Problems are undertaken in any of the fields of study in the Department. Prerequisites, adequate preparation in the specialized field, and undergraduates must attach to their preregistration material, written permission from the staff member who will supervise the work and assign the grade. Fernow Hall.

494. FISHERY BIOLOGY

Professor Webster, Associate Professors Eipper, Oglesby, and A. M. Phillips, Jr., and Assistant Professors Carlson and Forney.

495. WILDLIFE

Professor Hewitt, Associate Professor Thompson, and Assistant Professors McNeil, and Moen.

496. FORESTRY

Professor Hamilton and Associate Professor Morrow.

498. NATURAL RESOURCES

Professor Hamilton, Associate Professor Brumsted, and Assistant Professors McNeil and Wilkins.

499. REMOTE SENSING OF RESOURCES

Departmental Seminar. Mr. Hardy.

610. CONSERVATION SEMINAR

Spring term. Without credit. Th 4:30–6:30. Fernow Seminar Room. Staff.

All graduate students in the field of conservation are expected to participate.

BIOLOGY OF THE VERTEBRATES (BIOLOGICAL SCIENCES 270)

GENETICS (BIOLOGICAL SCIENCES 281)

COMPARATIVE ANATOMY OF VERTEBRATES (BIOLOGICAL SCIENCES 311)

TAXONOMY OF VASCULAR PLANTS (BIOLOGICAL SCIENCES 341)

GENERAL ECOLOGY (BIOLOGICAL SCIENCES 361)

BIOLOGY OF FISHES (BIOLOGICAL SCIENCES 369)

MAMMALOGY (BIOLOGICAL SCIENCES 471)

ORNITHOLOGY (BIOLOGICAL SCIENCES 472)

INTRODUCTION ENTOMOLOGY (ENTOMOLOGY 210)

ANIMAL PHYSIOLOGY (VETERINARY MEDICINE 310)

RESOURCE ECONOMICS (AGRICULTURAL ECONOMICS 450)

FOREST SOILS (AGRONOMY 404)

EDUCATION

Undergraduates may specialize in agricultural education and in science teaching, in nature interpretation, or in conservation education. It is possible to meet the requirements for a Bachelor of Science degree, and, at the same time, the requirements for provisional certification as a teacher of agriculture or science. With careful planning, students specializing in other departments in the College or in other colleges of the University may be able to meet certification requirements in these or other secondary school subjects.[1] A permanent certificate requires a fifth year. Graduate study is also required for those wishing to become educational researchers, or to enter educational administration, guidance, and other fields of specialized service.

Students intending to teach should contact an appropriate member of the staff in education to ascertain requirements and to avoid conflicts or delay in completing the program.

For students specializing in nature interpretation and conservation education, there are no state certification requirements. Such specialists are essentially teachers, however, so their preparation includes substantial course work in the sciences and communication skills.

[1]For other courses in education, consult the following *Announcements: Education, School of Industrial and Labor Relations, College of Home Economics,* and *College of Arts and Sciences.*

Agricultural Education

331. INTRODUCTION TO TEACHING AGRICULTURE

Spring term. Credit one hour. Required of juniors and others entering the directed teaching program in the senior or following year. M 2–4:25. Warren 101. Associate Professor Drake.

An introduction to the origin, development, objectives, course of study, and method of teaching agriculture in secondary schools, and to individual experience programs.

332. METHODS, MATERIALS, AND DIRECTED PRACTICE IN TEACHING AGRICULTURE IN THE SECONDARY SCHOOL

Fall term. Credit nine hours. Staff in agricultural education.

Directed participation in off-campus centers in the specific and related problems of teaching agriculture on the junior and senior high school levels, which includes adjustment in the school and community; evaluation of area resources, materials of instruction, and school facilities; organization and development of local courses of study; launching and directing supervised farming programs; planning for and teaching all-day classes; advising Future Farmer chapters; and other problems relating to development of a balanced program for vocational education in agriculture in a local area.

433. SPECIAL PROBLEMS IN AGRICULTURAL EDUCATION (S and U optional)

Graduate and undergraduate. Fall or spring term. Credit one or two hours. Th 1:25. Warren 231. Professor Bail and staff.

The purpose is to provide students an opportunity to study individually or as a group, selected problems in agricultural education to meet the particular needs of the students.

434. ORGANIZATION AND DIRECTION OF OUT-OF-SCHOOL PROGRAMS

Fall term. Credit three hours. Professor Cushman.

Emphasis will be placed on solving the problems encountered by teachers of agriculture in such phases of the out-of-school program as making arrangements to have a program, determining instructional needs and planning programs of instruction, teaching in groups, giving individual instruction, organizing and advising the local out-of-school association, and evaluating the out of school program.

531. SUPERVISION IN AGRICULTURAL EDUCATION

Fall term. Credit two hours. Offered in alternate years. Open to students with experience in teaching agriculture, or by permission. W 2:30–4:25. Plant Science 141. Professor Bail.

The function of supervision, program planning, and supervisory techniques as applied to state programs in agricultural education.

532. ADVANCED METHODS AND MATERIALS OF TEACHING AGRICULTURE

Fall term. Credit two hours. M 2:30–4:25. Warren 101. Assistant Professor Berkey.

Consideration is given to an analysis of selected teaching techniques and to the selection, preparation, and use of instructional materials in agriculture.

533. PLANNING COURSES OF STUDY AND AGRICULTURAL EXPERIENCE PROGRAMS

Spring term. Credit three hours. M F 1:25–2:55. Warren 31. Professor to be appointed.

Guiding principles, objectives, and sources of information will be developed for planning the courses of study and teaching calendar. Consideration will be given to principles, meaning, and function of agricultural experience programs, and how they are planned, developed, and used as a means of instruction.

534. EDUCATION FOR LEADERSHIP OF YOUTH AND ADULT GROUPS

Fall term. Credit two hours. F 1:25–3:20. Warren 101. Professor Cushman.

Designed for leaders in the field of agricultural education who are responsible for organizing programs. A consideration of the principles involved in organizing and conducting out-of-school programs for young and adult groups.

535. PLANNING AND CONDUCTING PROGRAMS OF TEACHER PREPARATION IN AGRICULTURE

Fall term. Credit two hours. Given in alternate years. T 1:25–3:20. Plant Science 114. Associate Professor Drake.

Open to persons with teaching experience in agriculture who are preparing for or are engaged in the preparation of teachers, or in related educational service.

[536. ORGANIZATION AND ADMINISTRATION OF AGRICULTURAL EDUCATION

Spring term. Credit two hours. Given in alternate years. W 2:30–4:25. Warren 31. Professor Cushman.] Not given in 1969–70.

Designed for teachers, high school principals, teacher trainers, supervisors, and others who are responsible for the administration of agricultural programs or who wish to qualify for this responsibility. Emphasis will be placed on interpreting the vocational acts and on problems of administration at the local and state level.

538. TEACHING GENERAL AGRICULTURE IN THE SECONDARY SCHOOL

Spring term. Credit two hours. F 4:15–6. Warren 31. Professor Tom.

The organization, purpose, and content of courses in agriculture in junior and senior high schools to serve those who elect to study agriculture for its general educational values in preparation for everyday living.

539. EVALUATING PROGRAMS OF AGRICULTURAL EDUCATION

Spring term. Credit two hours. Given in alternate years. Open to students with experience in teaching agriculture, or by permission. T 1:25–3:20. Warren 31. Associate Professor Drake.

Students will study objectives and evaluative criteria, and will develop criteria and procedures for evaluation of programs of agricultural education in the secondary schools.

630. SEMINAR IN AGRICULTUURAL EDUCATION (S and U exclusive)

Spring term. Credit one hour. Th 2:30–4:25. Warren 31. Professor Tom.

Recommended for Master's degree candidates who have had teaching experience and doctoral candidates with majors and minors in agricultural

education. The seminar will be primarily centered around current problems and research in the field not included in other course work.

Curriculum and Instruction

440A. OBSERVATION AND STUDENT TEACHING (S and U optional)

Fall or spring term. Credit six hours. Hours to be arranged. Professor Peard, Mrs. Ocvirk, Messrs. Holman, Pfaff, and Teetor.

For undergraduate students preparing to teach English, languages, and mathematics in the secondary schools. (Prospective science teachers, see Course 409, page 126). Opportunities to observe the work of experienced teachers and to do directed teaching in a secondary school are provided. Seminars and student teaching conferences arranged with emphasis on discussion of teaching problems. Students should also enroll in the appropriate special methods course which follows.

440L. TEACHING LANGUAGES IN SECONDARY SCHOOLS

Fall or spring. Credit three hours. Hours to be arranged. Mr. Teetor.

440M. TEACHING MATHEMATICS IN SECONDARY SCHOOLS

Fall or spring term. Credit three hours. Hours to be arranged. Mr. Holman.

444. SEMINAR IN THE TEACHING OF SECONDARY MATHEMATICS

Spring term. Credit three hours. T Th 4–5:15. Warren 232. Associate Professor Geiselmann.

Useful materials and practical methods for effective teaching of mathematics in the junior and senior high schools. Attention will be given to research in mathematics education, and to recent proposals for curriculum revision. Special interests of the students serve as a guide for the further selection of topics.

445. TEACHING READING AND STUDY SKILLS

Spring term. Credit three hours. Limited to seniors and graduate students. Professor Pauk.

For teachers, administrators, guidance counselors, and supervisors. Pertinent research as well as the psychology and philosophy of developmental reading and study skills will be examined. Teaching methods and sample materials for classroom use will be demonstrated and discussed.

540. THE ART OF TEACHING (S and U optional)

Fall and spring terms. Credit and hours as arranged. Students may register only with the consent of appropriate supervisor. Professors Peard and Wardeberg, Associate Professor Geiselmann, and Assistant Professor to be appointed.

For students enrolled in fifth-year teacher education programs. Students will be assigned to elementary and secondary schools for directed field experience.

542. SEMINAR IN SECONDARY EDUCATION

Fall term. Credit three hours. Limited to graduate students. Th 4–6 and one hour to be arranged. Plant Science 141. Staff.

Historical background and theoretical considerations relating to curriculum and instruction in American secondary schools.

545. THE CURRICULUM OF AMERICAN SCHOOLS

Fall term. Credit three hours. Limited to graduate students.

A survey of the basic elements involved in making curriculum decisions, and an examination of contemporary curriculum developments in elementary and secondary schools.

546. TEACHING READING AND LANGUAGE SKILLS

Fall term. Credit three hours. T Th 2:30–3:45. Warren 231. Professor Wardeberg.

Materials and techniques in teaching the language arts in the elmentary school; special emphasis on the teaching of reading.

547. SEMINAR IN ELEMENTARY EDUCATION (S and U optional)

Spring term. Credit and hours to be arranged. Professor Wardeberg.

A problems seminar, to study current problems and research in this field.

[549. MODERN MATHEMATICS FOR THE ELEMENTARY TEACHER

Fall term. Credit three hours. T 1:25–3:35. Warren 231. Associate Professor Geiselman.] Not given in 1969–70.

An introduction to the new topics, materials, and techniques which are reflected in modern mathematics curricula, grades K-6.

645. SEMINAR IN CURRICULUM THEORY AND RESEARCH (S and U optional)

Spring term. Credit three hours. Registration by permission of instructor. T 1:25–3:30. Plant Science 37. Staff.

Educational Administration

561. THEORY AND PRACTICE OF ADMINISTRATION

Fall term. Credit three hours. M W 2:30–4. Warren 260. Assistant Professor Egner.

The course is keyed to concepts and research findings in the social and behavioral sciences that are basic to the administration of educational organizations. Institutional and individual problems are analyzed from the viewpoint of organizational dilemmas and role conflict.

562. THE PRINCIPALSHIP

Spring term. Credit three hours. W 4–6. Bradfield 105. Professor Hixon.

Organized to enable recognition and cognition of the administrative functions essential to effective elementary and secondary schools. Analysis will include the elementary and secondary school as institutions, innovation in organization and curriculum, administration of instructional and non-instructional personnel, and community relationships. Each student will elect to specialize at the elementary or secondary school level for an individually planned program of intensified study.

563. SOCIAL CONTEXT OF EDUCATIONAL ADMINISTRATION

Spring term. Credit three hours. M W 2:30–4. Warren 145. Professor to be appointed.

The purpose of this course is to familiarize the student with environmental factors which influence administrative behavior in formal organizations. Three perspectives will be used in viewing organizations in their social

context. Using a structural approach, discussion will center on the links between the status divisions of society and organizations. The political approach will examine power relations between organizations and their environment. The cultural perspective will examine the role of norms, values and ideologies in organizational behavior. The course will be organized as a seminar. Students will be expected to conduct and report a small scale empirical research project.

564. SCHOOL FINANCE AND FACILITIES

Spring term. Credit three hours. Prerequisite, Course 561 or equivalent. Time to be arranged. Assistant Professor Haller and staff.

The role of the administrator in providing leadership in the provision and maintenance of funds and facilities. Marshalling personnel and material for school operation. Sources of school support. Estimation, interpretation and management of expenditures. Planning, constructing and financing a school building. Utilization, operation and management of the school plant.

565. SUPERVISION OF INSTRUCTION

Spring term. Credit three hours. T Th 11:15–12:45. Warren 145. Professor Wardeberg.

A basic course in the nature and scope of supervision; fundamental principles and various procedures are considered. Open to those already in supervisory positions, either in schoolwork or elsewhere, and experienced persons aspiring to become supervisors.

567. EDUCATION LAW

Fall term. Credit three hours. W 4–6. Warren 232. Professor Hixon.

Review and analysis of federal and state legislation, court decisions, opinions and regulations which affect educational institutions. Particular attention is given to New York State legislation.

569. PERSONNEL ADMINISTRATION

Fall term. Credit three hours. Th 4–6. Bradfield 105. Assistant Professor Egner and Assistant Professor Haller.

Designed to provide an introduction to modern psychological and sociological perspectives of personnel administration. Three purposes are paramount: (1) to acquaint the student with a variety of ways of conceiving the problems of personnel administration, (2) to acquaint the student with relevant research, and (3) to develop some facility in the analysis of conceptual schemes and research projects.

668. SEMINAR IN EDUCATIONAL ADMINISTRATION

Spring term. Credit three hours. Prerequisites, Course 569 or 561, or consent of instructor. Time to be arranged. Warren 31. Assistant Professor Egner and staff.

Planned for advanced students in administration. Topic for 1969–70 to be announced.

Educational Psychology and Measurement

110. GENERAL PSYCHOLOGY

Fall or spring term. Credit three hours. May not be taken for credit by students who have had Psychology 101 or equivalent. Two lectures, a testing

and demonstration period, and one discussion section each week. Lectures, and testing period M W F 10:10. Plant Science 233. Discussion sections, Th or F 8, 9:05, 10:10, 11:15, 12:20, 1:25, 2:30, or 3:35. East Roberts 223. Assistant Professor McConkie.

A survey of research and theories in the field of psychology. Areas of emphasis include research methods, perception, learning and memory, language and thought, motivation and emotion, individual differences and psychological testing, personality development, and abnormal psychology.

411. EDUCATIONAL PSYCHOLOGY

Fall or spring term. Credit three hours. Prerequisite, an introductory course in psychology. Designed for students in teaching programs and/or those interested in the educational process. M W F 9:05. Comstock 245. Fall term, Associate Professor Ripple; spring term, Professor Glock. Special section for students in agricultural education, fall term, time to be arranged. Professor Glock.

Consideration of the outstanding facts and principles of psychology bearing upon classroom problems.

417. PSYCHOLOGY OF ADOLESCENCE

Spring term. Credit two hours. Freshmen and sophomores not admitted. Prerequisite, a course in general psychology. T 1:25–3:20. Warren 245. Associate Professor Ripple.

A survey of the nature of adolescent growth and development, with emphasis on some of the causal factors pertaining to adolescent behavior.

452. INTERPRETATION OF STATISTICS USED IN EDUCATION

Fall term. Credit one hour. T 12:20–1:10. Warren 31. Will be offered in the spring term only to those students concurrently enrolled in Course 453. Time to be arranged. Associate Professor Millman.

A brief introduction to the vocabulary and symbolism used in reporting empirical research in education. Both univariate and multivariate statistical procedures will be covered from an intuitive point of view.

453. INTRODUCTION TO EDUCATIONAL STATISTICS

Spring term. Credit three hours. Prerequisite, Course 452 (may be taken concurrently), or permission of the instructor. T Th 8–9:55. Plant Science 141. Associate Professor Millman.

A study of common statistical procedures encountered in educational literature and research. The course includes the mathematical bases, computation, and interpretation of univariate and multivariate descriptive and inferential statistics.

511. EDUCATIONAL PSYCHOLOGY

Fall term. Credit three hours. Permission of instructor required. M W F 11:15. Warren 31. Professor Glock.

A basic course in educational psychology for graduate students.

551. EDUCATIONAL MEASUREMENT

Spring term. Credit three hours. Not offered every year. Permission of the instructor required. M 4–6; third hour to be arranged. Comstock 145. Professor Glock.

A study of the construction of achievement tests and the use of aptitude tests, achievement tests, and other measuring instruments in the classification and guidance of pupils and improvement of instruction.

555. USE AND INTERPRETATION OF TESTS IN GUIDANCE AND PERSONNEL ADMINISTRATION

Fall term. Credit three hours. Th 4–6. Warren 232. Professor Andrus.

Open to students in guidance or personnel administration and to classroom teachers who expect to work with standardized group tests. Deals with the historical development, use, and interpretation of aptitude tests as a basis for guidance and selection in public schools, colleges, and/or industry. Designed to meet the New York State certification for guidance counselors.

599. METHODS OF EDUCATIONAL INQUIRY

Fall and spring terms. Credit three hours. Prerequisite, one course in statistics or Course 452 taken concurrently. T Th 2:30–4. Bradfield 108. Associate Professor Millman and staff.

An introduction to the methods that underlie the conduct of significant research in education. Emphasis will be placed upon describing and analyzing such procedures as forming concepts, developing educational products, making observations and measurements, performing experiments, building models and theories, providing explanations, and making predictions.

613. SEMINAR IN EDUCATIONAL PSYCHOLOGY

Fall term. Credit three hours. Permission of instructor required. Hours to be arranged. Professor Glock.

Topic to be announced.

616. SEMINAR IN EDUCATIONAL RESEARCH

Fall term. Credit three hours. Prerequisites, Courses 453 and 599 or permission of the instructor. Time to be arranged. Associate Professor Millman.

The topic of the seminar this term is the design of educational experiments. It emphasizes the design of controlled, comparative experiments for the purpose of testing hypotheses, establishing relations, evaluating innovation, etc. First portion of the course will be devoted to the reading and discussion of a rather extensive core of relevant literature. During the second portion of the course, students are expected to present papers in which specific experimental design consideration is viewed in the context of a class of educational experiments.

617. SEMINAR IN VERBAL LEARNING

Fall term. Credit three hours. Prerequisite, Psychology 306 or equivalent. Hours to be arranged. Assistant Professor McConkie.

A study of current issues in the learning, retention, and transfer of verbal materials.

618. SEMINAR IN EDUCATIONAL PSYCHOLOGY

Spring term. Credit three hours. Permission of the instructor required. Hours to be arranged. Associate Professor Ripple and staff.

Emphasis on theoretical considerations of various areas in educational psychology. Primarily for doctoral students. Not designed for project students earning a Master's degree.

Extension and Continuing Education

Other divisions and departments that offer additional courses helpful in the field of extension education are:

Home Economics
Rural Sociology
Sociology
Agricultural Economics
Anthropology

Extensive flexibility is permitted each student in the selection of a course program to meet his special interests and professional needs.

522. EDUCATING FOR COMMUNITY ACTION

Spring term. Credit three hours. Open to juniors and seniors by consent. M W F 11:15. Warren 232. Associate Professor Bruce.

The design and execution of the educational aspects of community action programs, including cooperative extension.

523. ADMINISTRATION AND SUPERVISION OF EXTENSION AND ADVISORY PROGRAMS

Fall term. Credit three hours. W 1:25–3:20 and one hour to be arranged. Warren 132. Associate Professor Bruce.

An application of principles of administration and supervision to the problems of organizing and operating informal education and development programs.

524. DESIGNING PROGRAMS OF DEVELOPMENTAL CHANGE

Fall term. Credit three hours. For graduate students interested in the principles and procedures basic to the development and execution of extension, adult, community development and other programs of continuing education. Lecture, M 10:10. Lecture-discussion, T 1:25–3:20. Warren 132. Professor Leagans.

A study of the theories, problems, principles, and general procedures commonly involved in developing and carrying out successful educational programs to promote economic and social change.

525. COMMUNICATING TECHNOLOGY

Spring term. Credit three hours. For graduate students interested in a comprehensive understanding of theory, principles, procedures and techniques related to the communication of technology as applied in adult, extension and community development programs. Lecture, M 10:10. Lecture-discussion, T 1:25–3:20. Warren 132. Professor Leagans.

Analysis of basic elements in the communications process with emphasis on the nature and role of the communicator, audience, message, channels, message treatment and audience response.

[621. SPECIAL STUDIES IN EXTENSION EDUCATION

Fall term. Credit two hours. Lectures, individual time to be arranged. Professor Leagans and Associate Professor Bruce.] Not given in 1969–70.

The objective is to provide assistance in thesis preparation to graduate students in extension education. The course consists of three parts: (1) exploration of potential fields and specific delineation of thesis areas; (2) setting up a plan of thesis organization including establishing of objectives or hypotheses, preparation of questionnaires, or other research instruments, collection, analysis, and interpretation of data in line with objectives; and (3) preparation of the thesis, its writing, editing, revising, and styling.

626. SEMINAR: COMPARATIVE EXTENSION EDUCATION SYSTEMS

Fall term. Credit two hours. Open to graduate students and advanced undergraduates. Th 1:25–3:20. Warren 132. Professor Leagans.

A comparative analysis of the objectives, organization, procedures, achievements and problems of selected extension education and community development agencies and programs in different circumstances of economic, social, and political development and in different agricultural resource environments. Country programs for major consideration are selected in line with the interests of seminar members.

627. SEMINAR: IMPLEMENTING EXTENSION AND COMMUNITY DEVELOPMENT PROGRAMS IN DEVELOPING COUNTRIES

Spring term. Credit two hours. Open to advanced students with experience in rural development programs by permission of the instructor. Th 1:25–3:20. Warren 132. Professor Leagans.

Analysis of major problems of implementing programs for economic and social change in non-western cultures. Key problems including administrative organization and policy, selection and training of personnel, setting objectives and goals, financing programs, communication and evaluation will be considered along with others suggested by seminar members.

628. SEMINAR: CURRENT PROBLEMS AND ISSUES IN EXTENSION EDUCATION

Spring term. Credit two hours. Open by permission of instructor to graduate students in extension education or other fields with special relevance to the seminar topic. W 1:25–3:20. Plant Science 141. Associate Professor Bruce.

A major area of concern to extension education will be selected for intensive study by participating students and faculty.

SEMINAR: INTERNATIONAL AGRICULTURAL DEVELOPMENT (INTERNATIONAL AGRICULTURE 600)

ADULT EDUCATION

See *Announcement of the College of Home Economics* (H.E. Education 537).

Guidance and Personnel Administration

580. STUDENT CULTURE IN THE AMERICAN COLLEGE

Spring term. Prerequisite, consent of the instructor. Credit three hours. M W 1:45–2:45. Plant Science 37. Assistant Professor Hedlund.

Study of the student culture in the American college with emphasis on current research.

581. STUDENT PERSONNEL ADMINISTRATION

Fall term. Credit three hours. Prerequisite, permission of the instructor. T Th 1:25–2:45. Plant Science 141. Assistant Professor Hedlund.

Analysis of the objectives, functions, and organization of student personnel services in higher education. Emphasis on behavioral science theories supporting student personnel administration.

582. EDUCATIONAL AND VOCATIONAL GUIDANCE

Fall term. Credit two hours. For graduate students only. T 4:15–6. Warren 232. Professor A. G. Nelson.

Principles and practices of educational and vocational guidance. Historical and theoretical background of the guidance movement; educational, vocational, and community information needed; the study of the individual;

group methods; counseling; placement and follow-up; the organization, administration, and appraisal of guidance programs.

583. COUNSELING

Spring term. Credit two hours. For graduate students only. Prerequisite, permission of instructor. M 4:15–6. Warren 232. Professor A. G. Nelson.

Principles and techniques of counseling with individuals concerning various types of educational, social, and vocational and social adjustment problems at the high school and college levels.

584. GROUP TECHNIQUES IN GUIDANCE

Spring term. Credit two hours. Prerequisite, permission of the instructor. T 4:15–6. Warren 201. Professor A. G. Nelson.

Methods and materials for presenting educational and orientation information to students. Theory and practice of group guidance and counseling in a group setting.

585. OCCUPATIONAL AND EDUCATIONAL INFORMATION

Fall term. Credit four hours. Permission of the instructor required. M 4:15–6. Field trips and laboratory to be arranged. Warren 232. Professor A. G. Nelson.

Survey and appraisal of occupations and training opportunities; study of sources of educational and vocational information; job analysis; vocational trends. Field trips to places of employment. Practicum exercises.

602. FIELD LABORATORY IN STUDENT PERSONNEL ADMINISTRATION

Fall or spring term. Credit and hours to be arranged. Prerequisite, consent of instructor. Staff.

Directed field project in student personnel administration.

681. SEMINAR IN STUDENT PERSONNEL ADMINISTRATION (S and U Optional)

Fall or spring term. Credit two hours per term. Maximum credit four hours. Prerequisite, permission of the instructor. F 9:05–11. Warren 101. Assistant Professor Hedlund.

Topic varies.

History, Philosophy, and Sociology of Education

470. EDUCATIONAL ISSUES IN A DEMOCRACY

Fall or spring term. Credit three hours. Open to juniors by consent, seniors and graduate students. Registration in morning sections limited to fifty students; afternoon sections, 25 students. M W F 10:10, Warren 131; or T Th 2:30–4. East Roberts 222. Professors Ennis, Peard, and Stutz. Associate Professor Gowin. Special honors tutorial is offered by Associate Professor Gowin.

A study of the persistent problems of education in a democracy.

471. LOGIC IN TEACHING

Spring term. Credit three hours. Consent of instructor required. T Th 2:30–4. Warren 131. Professor Ennis.

A consideration of definition, explanation, proof, and the structure of subject matter as they bear upon the work of the classroom teacher.

472. PHILOSOPHERS ON EDUCATION

Fall term. Credit three hours. For graduates and advanced undergraduates. Consent of instructor required. M W 2–3:30. Warren 31. Professor Peard.

Selected writings by such philosophers as Plato, Descartes, Rousseau, and Dewey will be examined in their own right and for the light they throw on the persistent problems in education.

473. CONTEMPORARY PHILOSOPHY OF EDUCATION

Spring term. Credit three hours. Time to be arranged. Associate Professor Gowin.

Topic for 1969–70: Structure of knowledge.

574. HISTORY OF AMERICAN EDUCATION

Fall term. Credit three hours. For graduate students; seniors admitted with permission of the instructor. M 4–6. Warren 31. Professor Stutz.

An examination of the role of education in shaping American society. Chief emphasis will be on the period from 1820 to 1900.

578. COMPARATIVE EDUCATION

Spring term. Credit three hours. For graduate students. M 4–6. Warren 31. Professor Stutz.

A comparative treatment of several national systems of education from a historical perspective.

598. EDUCATION AS A FIELD FOR INQUIRY

Fall term. Credit three hours. W F 2:30–4. Plant Science 37.

Designed primarily for students without previous training or experience in the field of education, this course is intended to provide insight into the nature and content of the field to which their research efforts will be directed. Deals with the structure of the educational enterprise, its history, its objectives and the ways it seeks to achieve them, its main concerns, emphases, and sources of strain.

671. SEMINAR: ANALYSIS OF EDUCATIONAL CONCEPTS

Spring term. Credit three hours. Admission by consent. W 2:30–4:40. Comstock 145. Professor Ennis.

Topic for 1969–70: To be announced.

672. SEMINAR IN EDUCATIONAL CLASSICS

Fall term. Credit three hours. Admission by consent. Professor Peard.

Topic for 1969–70: To be announced.

673. SEMINAR IN JOHN DEWEY'S PHILOSOPHY OF EDUCATION

Fall term. Credit three hours. For graduate students. Prerequisite, prior course in philosophy or philosophy of education and consent of the instructor. Associate Professor Gowin.

Dewey's conceptions of the nature of experience, knowledge, value, and metaphysics will be analyzed, as well as his method of philosophizing. Students will be expected to read widely in Dewey's writings, and in the writings of his critics and disciples. Primary aim is a mature, critical understanding and appraisal of Dewey's philosophy, especially as it centers upon education.

674. SEMINAR IN HISTORY OF EDUCATION

Spring term. Credit three hours. Admission by consent. M 3:35–5:35. Plant Science 141. Professor Stutz.

Topic for 1969–70: To be announced.

699. CONCEPTUAL PROBLEMS IN EDUCATIONAL INQUIRY

Fall term. Credit three hours. Primarily for doctoral candidates in their second year of residence. Prerequisite, Course 599 or equivalent, or permission of instructor. W 2:30–4:30. Warren 145. Professor Ennis.

An examination of such concepts as causation, operationism, validity, reliability, hypothetical construct, generalization, explanation, probability, and hypothetico-deductive method.

Science, Nature and Conservation Education

[401. OUR PHYSICAL ENVIRONMENT

Spring term. Credit three hours. Open only by written permission of the instructor. Limit eighteen students. Lecture, W 1:25. Practical exercises, W 2:30–4:25 and one other period to be arranged. Stone 7. Professor Rockcastle.] Not given in 1969–70.

A study of the commonplace phenomena and substances in our physical environment, and their use in demonstrating basic scientific principles. Frequent field trips and first-hand examination will be used in studying air, water, soil, light and sound, as well as some elementary mechanical and electrical devices. Emphasis will be placed on the physical environment as an aid to teaching the physical sciences in the public secondary schools.

[402. NATURAL HISTORY LITERATURE

Spring term. Credit two hours. Given in alternate years. Open only to students above sophomore rank. T Th 11:15. Stone 7. Professor R. B. Fischer.] Not given in 1969–70.

A survey of the writings in the nature, and conservation education fields, with special attention to outstanding writers and their works, designed for teaching and for leisure time reading. Recommended for those who plan to take Course 403.

403. NATURAL HISTORY WRITING

Fall term. Credit two hours. Given in alternate years. T Th 11:15. Stone 7. Registration by permission. Intended for seniors and graduate students. Professor R. B. Fischer.

Designed for persons who wish to perfect their ability to write popular articles for the specialized fields of natural history and conservation. Subject matter, types of articles, and outlets for students' articles are covered, along with the preparation of news releases, posters, brochures and periodical publications.

404–5. FIELD NATURAL HISTORY

Fall or spring term. Credit three hours. A full year course; may be taken either term or both terms. Open only to students above sophomore rank. Limited to eighteen students per section. Lecture, M 10:10. Stone 7. Weekly field trips and lecture, T or F 1:25–4:25, begin with the first meeting. Friday

section primarily for those experienced in field biology. Professor R. B. Fischer.

Devoted to studies of local plants and animals, their ecology and their use in nature interpretation, conservation education, and field biology programs. This is a methods and materials course useful to teachers at all levels.

407. TEACHING OF ELEMENTARY SCHOOL SCIENCE

Fall term. Credit three hours. Registration by permission. Limit eighteen students. Lecture, W 1:25; practical exercises, W 2:30–4:25 and one other period to be arranged. Stone 7. Professor Rockcastle.

The content and methods of elementary school science and nature study, wih field work and laboratory experience useful in classroom and camp. Designed particularly for those who are preparing to teach or supervise elementary school science.

408. METHODS OF TEACHING SCIENCE IN SECONDARY SCHOOLS

Fall or spring term. Credit three hours. For juniors, seniors, and graduate students without teaching experience. Prerequisite, Course 411 or the equivalent or concurrent registration. Open to students in science education intending to register for Course 409; permission of instructor required for all others. Limited to twenty students per section. Fall term, Th 1:25–4:25. Stone 7. Hours for observation to be arranged. Spring term, M or Th 1:25–4:25. Stone 7. Professor to be appointed.

Consideration of current methodology, newly developed curricula, and materials for teaching science in secondary schools. Attention is given to the aims and goals of science instruction in relation to classroom techniques. Systematic observations in local schools. Use of video tapes.

409. PRACTICE IN TEACHING SCIENCE IN SECONDARY SCHOOLS

Fall or spring term. Credit six or twelve hours. Prerequisites, Course 408 and permission of the instructor. Hours to be arranged. Professor to be appointed.

Supervised practice in teaching science in secondary schools, with frequent conferences. Special seminars scheduled in conjunction with practice teaching. Multimedia forms of feedback information concerning the classroom performance will be provided to the practice teacher.

505. NATURE CENTER OPERATION AND PROGRAMMING

Fall term. Credit three hours. Open only to students above sophomore rank. M W F 10:10. Stone 7. Professor to be appointed.

Designed for interpretive naturalists and others who will be responsible for showing persons their place in the environment they share with other organisms, explaining how man's actions affect the living things around him, and teaching what can and must be done to preserve the quality of the environment. Course content emphasizes methods of interpreting nature through the nature center program, and includes constructing teaching aids, designing and building nature trails, design and organization of a live museum, cataloging and storing teaching materials, making bulletin board displays, developing interest corners, guiding nature walks, making and presenting slide talks, giving lectures with visual aids, setting up photographic exhibits, and using schoolyard and neighboring teaching resources.

507. THE TEACHING OF SCIENCE

Fall term. Credit three hours. For graduate students interested in elementary, secondary or college science teaching. Limit twenty students. M 1:25–4:25. Stone 7. Professor Novak.

A consideration of learning theory as applied to problems of selection and organization of subject matter, methods of teaching and instructional innovation. Study of published research relevant to the improvement of science teaching. Course is conducted in a seminar style.

508. NATURE CENTER DEVELOPMENT AND DIRECTION

Spring term. Credit three hours. Open only to students above sophomore rank. M W F 10:10. Stone 7. Professor to be appointed.

Providing directors with the managerial skills needed for successful operation of a nature center, the course is organized around techniques such as recruiting, fund raising, publicity, personnel management, brochure production, public relations, allocating funds and budgeting, enlisting local support, liaison with schools, program development, natural area surveys, planning new buildings, adding to existing facilities, and determining staff needs; also, nature center directors as local conservation catalysts.

509. DEVELOPMENT OF CURRICULUM IN SCIENCE

Spring term. Credit three hours. For graduate students interested in elementary, secondary or college science teaching. Limit twenty students. M 1:25–4:25. Bradfield 108. Professor to be appointed.

Study of new science curriculum programs, including philosophy and rationale of the programs. Observation of classes using new materials. Concentrated study of science curriculum development in the area of individual student's interest. Course is conducted in a seminar style.

606. SCIENCE EDUCATION SEMINAR (S and U exclusive)

Fall or spring term. Credit one hour. Required of graduate students who major or minor in this division. M 4:30–6. Stone 7. Professors Fischer, Novak and Rockcastle.

General Education

499. INFORMAL STUDY IN EDUCATION (S and U optional)

Maximum credit three hours each term. Staff.

This privilege is granted to a qualified junior, senior, or graduate student, when approved by an adviser from the education staff who is personally responsible for the study. Undergraduates must attach to their preregistration material, written permission from the staff members who will supervise the work and assign the grade. Two purposes are sanctioned: 1) to engage in a study of a problem or topic not covered in a regular course; or 2) to undertake tutorial or honors study of an independent nature in the area of the student's research interests. The privilege is not designed to engage in a study supplementary to a regular course for the purpose of increasing the content and credit allocation of the course.

500. SPECIAL STUDIES (S and U optional)

Credit as arranged. Members of the staff. Limited to graduate students working on theses or other research projects. Each registration must be approved by a staff member who will assume responsibility for the work.

594. COLLEGE TEACHING

Spring term. Without credit. Members of the University staff.

Designed for those who plan to teach in college and universities. Con-

cepts and methods of teaching, organization of subject matter, motivation, learning, testing, grading, and similar problems are treated.

600. INTERNSHIP IN EDUCATION

Fall and spring terms. Credit two to six hours, as arranged. Members of the faculty.

Opportunity for apprentice or similar practical experience on the graduate level in educational administration, agricultural education, guidance, personnel administration, supervision, and other types of professional service in education.

698. PRACTICUM IN EDUCATIONAL RESEARCH

Fall and spring terms. Three to six credit hours per term. Hours to be arranged. Associate Professor Ennis and staff.

Participation in a research project under the direction of the principal investigator of said project. Level of responsibility will increase with the experience and capability of the candidate, the eventual goal being his assumption of responsibility for a portion of the research.

ENTOMOLOGY AND LIMNOLOGY

Students are accepted as majors in entomology and limnology only upon the consent of the head of the department or a member of the staff designated to act for him.

General Entomology

210. INTRODUCTORY ENTOMOLOGY

Spring term. Credit three hours. Prerequisite, Biological Sciences 101–102 or 103–104, or their equivalent. Lecture, T Th 10:10. Comstock 245. Laboratory, M T W Th or F 2–4:25. Comstock 100. Associate Professor Raffensperger and assistants.

A survey of the structure, biology, and classification of insects; an introduction to the study of insects as a major segment of the biological community, with attention to representative species of economic importance, the techniques and consequences of their control. Laboratory exercises in the anatomy and biology of insects and practice in the techniques of insect identification.

212. INSECT BIOLOGY

Fall term. Credit three hours. Prerequisite, Biological Sciences 101–102, or 103–104 (or concurrent registration); or their equivalent. Lecture, W F 11:15. Comstock 145. Laboratory, W or Th 2–4:25. Comstock 100. Assistant Professor Eickwort and assistants.

Designed to introduce the science of entomology by focusing on the basic principles of the systematics, morphology, physiology, behavior, and ecology of insects. The laboratory in early fall includes field trips to study and collect insects in their natural environment.

[518. TECHNIQUES OF BIOLOGICAL LITERATURE

Fall term. Credit two hours. Given in alternate years. Lectures, T Th 9:05. Comstock 300. Professor Franclemont.] Not given in 1969/70.

History of the development of entomological literature and a critical study

of the biologists' works of reference and the principles of zoological nomenclature. Practice in the use of indices and bibliographies, and practice in the preparation of the latter.

Insect Morphology

322. INSECT MORPHOLOGY

Fall term. Credit four hours. Prerequisite, Course 210 or 212 or permission of instructor. Lectures, M F 10:10. Laboratories, M F 1:25–4:25. Comstock 270. Assistant Professor Eickwort.

An introduction to the external and internal anatomy of insects, with emphasis on the comparative and functional aspects. The laboratory is devoted largely to dissection.

Insect Taxonomy

331. INTRODUCTORY INSECT TAXONOMY

Spring term. Credit three hours. Prerequisite, Course 210 or 212. Lecture, Th 10:10. Laboratory, T Th 2–4:25. Comstock 300. Professor W. L. Brown.

An introduction to the systematics and distribution of insects. Laboratory practice in the identification of orders, families, and representative genera of insects; methods of collection and preparation of insect specimens. Field trips are taken in the late spring.

531. TAXONOMY OF THE SMALLER ORDERS OF INSECTS

Fall term. Credit three hours. Given in alternate years. Prerequisite, Course 331. Discussion, F 10:10. Laboratory, F 2–4:25 and one other by arrangement. Comstock 300. Professor W. L. Brown.

Discussions of the classification, evolution, and bionomics of the orders and families of insects, exclusive of the larger orders of Holometabola. Laboratory studies on the literature and on the characters and classification of representative genera and species. Continuation of taxonomy of Holometabola is in Courses 532, 533, and 534.

[532. TAXONOMY OF THE IMMATURE STAGES OF HOLOMETABOLA

Fall term. Credit three hours. Given in alternate years. Prerequisite, Course 531 or permission of the instructor. Lecture, F 10:10. Laboratory, W F 2–4:25 and one other by arrangement. Comstock 300. Professor Franclemont.] Not given in 1969–70.

Lectures on the structure and habits of insect larvae. Laboratory studies of the literature, comparative morphology, and identification of the immature stages of the Holometabola.

[533. TAXONOMY OF THE COLEOPTERA AND LEPIDOPTERA

Spring term. Credit three hours. Given in alternate years. Prerequisite, Course 331. Lecture, W 10:10. Laboratories, W F 2–4:45. Comstock 300. Professor Franclemont.] Not given in 1969–70.

Laboratory studies on the literature and on the character and classification of representative genera and species of these orders.

534. TAXONOMY OF THE DIPTERA AND HYMENOPTERA

Spring term. Credit three hours. Given in alternate years. Prerequisite, Course

331. Lecture, W 10:10. Laboratory, W F 2–4:25 and one other by arrangement. Comstock 300. Professor W. L. Brown.

Laboratory studies on the literature and on the characters and classification of representative genera and species of these orders.

EVOLUTIONARY THEORY (BIOLOGICAL SCIENCES 475)

Economic Entomology

441. PRINCIPLES OF ECONOMIC ENTOMOLOGY

Fall term. Credit three hours. Prerequisite, Course 210 or 212 or the equivalent. Enrollment will be limited. Lectures, Th 2–4. Comstock 145. Laboratory, T 2–4:25. Comstock 100. Several all-afternoon field trips by arrangement. Professor to be appointed.

Principles in the management and control of insect populations.

442. ENTOMOLOGY OF TREES AND SHRUBS

Fall term. Credit three hours. Given in alternate years, but would be given for ten students any year. Lectures, T Th 9:05. Comstock 145. Laboratory, F 2. Caldwell 82. Associate Professor Johnson.

Deals with nature, recognition, diagnosis, biological evaluation, economic appraisal, and treatment of insects attacking woody plants in the United States.

541. EXPERIMENTAL METHODS IN ECONOMIC ENTOMOLOGY

Fall term. Credit three hours. Given in even-numbered years. Designed primarily for graduate students but open to qualified undergraduates. Prerequisites. Course 210 or 212 or the equivalent, and Plant Breeding 510. Enrollment will be limited. Permission to register is required. Lectures, M W F 11:15. Comstock 245. Laboratory and field trips to be arranged. Professor Gyrisco.

An advanced course dealing with the principles and methods of insect control and experimentation. Emphasis will be placed on the use of and instrumentation for work in modern methods of insect control, biology and applied ecology. Field plot designs, field techniques, analysis of data, practical sampling methods, regulations concerning pesticide residues on field crops and in milk and meat, and effects of pesticides on pollinators will be stressed. Soil insects, small grain insects, and forage insects will be used largely as examples.

545–546. ECONOMIC ENTOMOLOGY

Throughout the year. Credit three hours each term. Prerequisites, Course 210 or 212 and permission to register (see Professor Gyrisco). Open to qualified juniors and seniors but primarily designed for graduate students, particularly those majoring or minoring in entomology. Lecture, M 10:10–12:05. Comstock 145. Laboratory, M 2–4:25. Comstock 100. Professors Brann, Dewey, Glass, Gyrisco, Lisk, Matthysse, Muka, O'Brien, Pimentel, and Rawlins, Associate Professor Morse, and Assistant Professors Feeny, W. T. Johnson, Tauber, and Wilkinson.

An advanced special topics course dealing primarily with the principles and problems of economic entomology such as insect population dynamics, natural control of insects, residues in food crops, nature of chemical control, application equipment, insect transmission of plant diseases, planning experiments, insects of fruit, insects of livestock, uses of aircraft in pest treatments, pesticide laws and regulations, insects of ornamentals and greenhouse crops.

Parasitology

351. INTRODUCTORY PARASITOLOGY

Spring term. Credit four hours. Prerequisite, Biological Sciences 101–102, or 103–104 or their equivalent. Course 210 or 212 and Biological Sciences 371 are also recommended. Limited to twelve students per section. Lectures, M W 10:10. Comstock 245. Laboratories, M W or T Th 2–4:25. Comstock 200. Professor Travis.

An introduction to the symbiotic way of life among animals, primarily the protozoan, helminth, and arthropod species of temperate and tropical areas. Special emphasis is given to the recognition of selected symbiotic species and how they live with their hosts.

352. INTRODUCTORY PARASITOLOGY (LECTURES)

Spring term. Credit two hours. For upperclassmen and graduate students. Prerequisites, Biological Sciences 101–102 or 103–104 or their equivalent. Biological Sciences 371 is recommended. Lectures, M W 10:10. Comstock 145. Professor Travis.

The course is the same as the lecture portion of Course 351.

551. ADVANCED PARASITOLOGY (PROTOZOA AND HELMINTHS)

Fall term. Credit three hours. Given in alternate years. Undergraduates only by permission. Prerequisite, Course 351 or its equivalent. Lecture and one laboratory, T 1:25–4:24, and Th 2–4:25. Comstock 200. Professor Travis.

A continuation of Course 351 for graduate students interested in the parasitic protozoa and helminths. Practical experience with methods of collection, preparation; detailed studies on recognition and life cycles. Special emphasis is given to the parasites that are transmitted by arthropods in the tropics.

552. ADVANCED PARASITOLOGY (MEDICAL ENTOMOLOGY)

Fall term. Credit three hours. Given in alternate years. Undergraduates only by permission. Prerequisite, Courses 351 and 212 or their equivalent. Lecture and one laboratory, T 1:25–4:25 and Th 2–4:25. Comstock 200. Professor Travis.

A continuation of Course 351 for graduate students interested in medical or veterinary entomology. Practical experience with methods of collection, preparation; detailed studies on recognition, life cycles, and control. Special emphasis is given to causative agents, vectors, and intermediate hosts of disease-producing organisms. The study examples include species of world-wide distribution, especially those of tropical areas.

553. ADVANCED PARASITOLOGY (INSECT PATHOLOGY)

Spring term. Credit three hours. Prerequisites, a course in entomology, a course in a microbiological science, and permission of instructor. By appointment. Associate Professor Kramer.

A survey of the microbial and zooparasitic diseases of insects with emphasis on the natural history of the pathogens. Pathogens considered include viruses, rickettsiae, bacteria, spirochetes, fungi, protozoa, nematodes, and selected arthropods.

Apiculture

260. INTRODUCTORY BEEKEEPING

Spring term. Credit two hours. Lectures, T Th 11:15. Comstock 245. Associate Professor Morse.

Intended to afford a general knowledge of the fundamentals of beekeeping, including the life history, instincts, and general behavior of honey bees. Special attention is given to the role of bees in the cross-pollination of agricultural crops as well as production of honey and beeswax.

262. BIOLOGY OF THE HONEY BEE

Fall term. Credit one hour. Prerequisite, Biological Sciences 103–104 or the equivalent. Limited to ten students, registration only by permission. Fifteen laboratories by arrangement in September and October only. Associate Professor Morse.

A laboratory and field course in which the classical experiments on the vision, chemical senses, and language of the honey bee, as described by von Frisch, are repeated. Laboratories include demonstration of the sex attractant, swarm orientation, and the natural nest, and a study of wasp, bumble bee, and other social insect nests.

Environmental Biology

GENERAL ECOLOGY (BIOLOGICAL SCIENCES 361)

361. GENERAL ECOLOGY

Fall or spring term. Credit three hours. Not open to freshmen. Prerequisite, Course 101–102 or 103–104 or the equivalent. Lectures, T Th 9:05. Bradfield 101. Discussion, W or Th 1:25, 2:30, or 3:35. Comstock 245. Fall term, Assistant Professor Feeny; spring term, Assistant Professor Root.

Principles concerning the interactions between organisms and their environment. Influence of competition, social behavior, predation, and other factors on population size and dispersion. Role of energy flow and mineral cycling in determining the structure and productivity of ecosystems. Succession and classification of natural communities. Influence of climate and past events on the diversity and stability of communities in different regions of the world. Interspecific competition and the niche concept. Chemical interactions between organisms. Application of ecological principles to human problems. Modern evolutionary theory will be stressed throughout and attention given to conflicting ecological hypotheses.

471. AQUATIC ENTOMOLOGY AND LIMNOLOGY

Spring term. Credit three hours. Prerequisite, Entomology 210 or 212. Biological Sciences 361 is recommended. Lecture, F 10:10. Comstock 145. Laboratory, F 2–4:25, S 8–10:25. Professor Berg.

A field and laboratory study of the bionomics of fresh-water invertebrates. The course includes characteristics of fresh-water habitats, identification of insects and other invertebrates found in them, understanding of life cycles, and consideration of the ecological relationships among organisms in various aquatic biotopes.

572. LIMNOLOGY AND ENTOMOLOGY SEMINAR

Fall term. Credit one hour. Prerequisites, Entomology 471 or Biological

Sciences 462, and permission of instructor. Time and place to be arranged. Professor Berg.

Discussions and analyses of current concepts and problems in limnology and aquatic entomology, including the critical study of selected reference works and research papers.

577. BIOLOGICAL CONTROL AND INSECT BEHAVIOR

Fall term. Credit three hours. Consent of instructor is required. Time and place to be arranged. Assistant Professor Tauber.

Participants will critically review theory and method of biological control of pest species with emphasis on the role of behavior. This course may be repeated for credit.

595. ENVIRONMENTAL BIOLOGY

Fall term. Credit one hour. Permission to register is required. Weekly discussions by arrangement. Professor Pimental and staff.

Principles of the interaction between living systems and their resources are considered. Particular emphasis will be given to current problems in the management of our natural resources including new systems approach in the management of insect populations. Biological and bioenvironmental controls will be discussed.

SEMINAR IN POPULATION AND COMMUNITY ECOLOGY (BIOLOGICAL SCIENCES 661.)

Insect Physiology

483. INSECT PHYSIOLOGY

Fall term. Credit four hours. Open to seniors in entomology and graduate students. No prerequisites; biochemistry, physics, and a course in animal physiology recommended. Lectures, M W 9:05. Comstock 145. Laboratories, M W 2–4:25. Caldwell 294. Professor Patton.

An introductory to intermediate course in the physiology of insects primarily for graduate students in entomology.

Insect Toxicology and Insecticidal Chemistry

[590. INSECT TOXICOLOGY AND INSECTICIDAL CHEMISTRY

Spring term. Credit four hours. Given in alternate years. Prerequisites, general chemistry, and organic chemistry. Undergraduate students by permission. Lectures, M W F 8. Comstock 145. Laboratory, 1:25–4:25. Caldwell 294. Professor Lisk and Assistant Professor Wilkinson.] Not given in 1969–70.

The chemistry of insecticides and their metabolism and mode of action in insects and mammals. Analytical techniques in residue evaluation and laboratory techniques in evaluating effects on insects.

Research

RESEARCH

Fall and spring terms. Credit to be arranged. Prerequisite, permission to register. Undergraduates must attach to their preregistration material, written

permission from the staff member who will supervise the work and assign the grade.

510. ECOLOGY

Professors Berg, Gyrisco, and Pimentel, and Assistant Professors Feeny, Helgesen, Root, and Tauber.

511. BIOLOGICAL CONTROL

Professors Berg, Gyrisco, and Pimentel, Associate Professor Kramer, and Assistant Professors Feeny, Root, and Tauber.

512. BEHAVIOR

Assistant Professors Eickwort and Tauber.

515. INSECT PATHOLOGY

Assistant Professor Kramer.

520. MORPHOLOGY, HISTOLOGY, AND EMBRYOLOGY

Assistant Professor Eickwort.

530. TAXONOMY

Professors Brown, and Franclemont, Associate Professors Keeton and Pechuman, and Assistant Professor Eickwort.

540. ECONOMIC ENTOMOLOGY

Professors Brann, Dewey, Gyrisco, Matthysse, Muka, Pimentel, and Rawlins, and Associate Professors N. E. Johnson, W. T. Johnson, Raffensperger, and Semel, and Assistant Professors Helgesen and Tauber.

550. MEDICAL ENTOMOLOGY AND PARASITOLOGY

Professor Travis and Associate Professors Kramer and Raffensperger.

564. APICULTURE

Associate Professor Morse.

570. LIMNOLOGY

Professors Berg, Pimentel, and Travis.

585. PHYSIOLOGY

Professor Patton, Associate Professor Young, and Assistant Professor Wilkinson.

586. INSECT BIOCHEMISTRY

Associate Professor Young, and Assistant Professor Wilkinson.

596. TOXICOLOGY AND CHEMISTRY OF INSECTICIDES

Professors Dewey, Lisk, and O'Brien, Associate Professor Young, and Assistant Professor Wilkinson.

Seminar

JUGATAE

Fall and spring terms. M 4:30–5:30. Comstock 245.

The work of an entomological seminar is conducted by the Jugatae, an entomological club that meets for a discussion of the results of investigations by its members.

FLORICULTURE AND ORNAMENTAL HORTICULTURE

Instruction in the Department of Floriculture and Ornamental Horticulture is planned for students with the following interests: (1) commercial plant production, distribution, or utilization, including the management of greenhouses, nurseries, and wholesale and retail establishments; (2) developing a landscape service, including the planning, construction, planting, and maintenance of small properties; (3) superintendence of parks, golf courses, cemeteries, aboretums, or garden centers; (4) the culture and use of ornamental plants in the home garden and in the home; (5) turfgrass production and management; (6) scientific research and teaching; (7) landscape architecture.

Special curricula are set up to meet the needs of those students desiring training in the above fields.

Undergraduate students may plan their courses as preparation for graduate training leading to university teaching or research positions with universities, experiment stations, or industry.

Courses 101, 102, 103, 210, 212, 213, 315, and 423, are required of all students majoring in the Department. These students must also satisfy the department practice requirement based on experience with ornamental plants and their culture.

General Courses

GENERAL HORTICULTURE (VEGETABLE CROPS 103)

INTRODUCTION TO LANDSCAPE DESIGN (LANDSCAPE ARCHITECTURE 102)

101. GENERAL FLORICULTURE AND ORNAMENTAL HORTICULTURE (S and U optional for students not specializing in floriculture)

Fall term. Credit three hours. Lectures, M W 8. Plant Science 37. Laboratory, M or T 2–4:25. Plant Science 15. Professor Langhans.

An elementary course covering the principles and practices of growing ornamental plants in the garden, greenhouse, and home.

105. PRINCIPLES OF FLOWER ARRANGEMENT

Fall or spring term. Credit two hours. Enrollment limited to eighteen students for each laboratory section. Fall term: Lecture, Th 9:05. Plant Science 37. Laboratory, W or Th 2–4:25, or Th 10–12:35. Plant Science 22. Spring term: Lecture, T 10:10. Plant Science 37. Laboratory, W 2–4:25 or Th 10:10–12:35 or Th 2–4:25. Plant Science 22. Associate Professor Fox.

A study of the care and handling of flowers, the factors affecting keeping quality, and the design principles involved in the use of flowers and related decorative materials.

423. ENVIRONMENT AND ORNAMENTAL PLANT GROWTH

Fall term. Credit four hours. Given in alternate years. Prerequisites, Course 215. Biological Sciences 240; both may be taken concurrently with Course 423. Lectures, M W F 9:05. Plant Science 37. Laboratory, M 2–4:25. Plant Science 37 and greenhouses. Professor J. G. Seeley.

A comprehensive study of the application of basic science to the culture of ornamental plants.

Plant Materials

210. TAXONOMY OF CULTIVATED PLANTS

Fall term. Credit four hours. Intended primarily for departmental majors. Prerequisite, Biological Sciences 103–104 or its equivalent. Lectures, M W 10:10. Plant Science 37. Laboratory, M W 2–4:25. Plant Science 29. Associate Professor Ingram.

A study of the kinds of cultivated ferns and seed plants and their classification into families and genera. Emphasis is placed on methods of identification, the preparation and use of the analytical keys, the distinguishing characteristics of the families concerned, and their importance in ornamental horticulture.

213. WOODY-PLANT MATERIALS

Spring term. Credit four hours. Prerequisite, Course 210 or permission to register. Lectures, T Th 9:05. Plant Science 37. Laboratory and field trips, T and W or F 2–4:25. Plant Science 29. Associate Professor Mower.

A study of the trees, shrubs, and vines used in landscaping planting. Emphasis is placed on their characteristics and values for use as landscape material. The class visits Rochester parks and gardens.

312. HERBACEOUS PLANT MATERIALS

Fall term. Credit three hours. Prerequisite, Course 210 or permission to register. Lectures, T Th 10:10. Plant Science 37. Laboratory, T 2–4:25. Plant Science 29. Associate Professor Mower.

A study of the ornamental herbaceous plants used in landscape and garden plantings. Emphasis is placed on the identification, use, and culture of bulbs, annuals, and perennials.

313. WOODY-PLANT MATERIALS, ADVANCED COURSE

Fall term. Credit two hours. Prerequisite, Course 213. Lecture and laboratory, F 1:25–4:25. Plant Science 15. Associate Professor Mower.

The important groups of landscape materials and the literature of the subject. A knowledge of the ordinary woody plants for landscape use in the Northeast is presumed. Emphasis is on less-known northern plants and upon plant groups basic in landscape design in other regions of the United States. Opportunities for practice in the determination of unknowns and in the use of the literature are provided. A trip is taken to Washington, D.C., and vicinity.

Nursery Management

314. TURFGRASS MANAGEMENT

Spring term. Credit two hours. Prerequisite, Agronomy 200 or permission to register. Lecture, W 11:15. Plant Science 37. Laboratory, Th 2–4:25. Plant Science 15. Professor Cornman.

The principles, practices, and materials for the construction and maintenance of lawn, sports, and utility turfgrass areas.

[315. PLANT PROPAGATION

Fall term. Credit three hours. Given in alternate years. Prerequisite, Biological Sciences 240 or the equivalent, or permission of the instructor. Lectures, T

Th 8, Plant Science 37. Laboratory, Th 2–4:25. Greenhouses and nurseries. Associate Professor Tukey.] Not given in 1969–70.

The germination of seeds, rooting of cuttings, manipulation of bulbs, and propagation of plants by budding and grafting are studied from the standpoint of the basic mechanisms governing the initiation and development of roots and shoots, including the physiology of dormancy, growth regulators, and germination.

317. NURSERY CROP PRODUCTION AND MAINTENANCE

Spring term. Credit four hours. Prerequisite, Course 215. Lectures, M W F 8. Plant Science 37. Laboratory, M 2–4:25. Greenhouses and nursery. Assistant Professor Good.

The problems of commercial propagation and growing of nursery plants to marketable stage. Digging, storage, and packaging of nursery stock, and commercial planting and maintenance practices are included. Plant growth is considered in relation to soil and climate factors of site. Control of growth by watering, cultivation, and pruning of landscape plants in garden and park planting is stressed. Field problems and observational trips are included in laboratory work.

318. ADVANCED TURFGRASS MANAGEMENT

Fall term. Credit two hours. Prerequisite, Course 314 or the equivalent. Lecture, M 10:10. Plant Science 141. Laboratory, M 2–4:25. Plant Science 22. Professor Cornman.

A continuation of Course 314, with emphasis on the application of basic principles to problems of such large-scale operations as landscape maintenance and the execution and maintenance of golf courses, athletic fields, industrial grounds, and nursery sod production. A weekend inspection trip is taken to experimental test plots and special turf areas.

Commercial Floriculture

325. FLOWER STORE MANAGEMENT

Spring term. Credit three hours. Prerequisites, Course 105 and permission to register. Lectures. T Th 8. Plant Science 22. Laboratory, T 2–4:25. Plant Science 143. Associate Professor Fox.

Lectures devoted to flower shop management, business methods, merchandising, and marketing of floricultural commodities. Laboratories include the application of subject matter and the principles of commercial floral arrangement and design. A required two-day field trip is made to flower shows and to wholesale and retail florist establishments.

424. FLORIST CROP PRODUCTION

Spring term. Credit four hours. Given in alternate years. Lectures, M W F 9:05. Plant Science 141. Laboratory, W 2–4:25. Greenhouses. Professor Boodley.

The commercial production of florist crops. Emphasis is on culture of plants as influenced by greenhouse environment. Field trips are made to commercial greenhouses.

[425. GREENHOUSE PRODUCTION MANAGEMENT

Spring term. Credit three hours. Given in alternate years. To be preceded by an elementary course in horticulture or equivalent. Lectures, M W 9:05. Plant Science 37. Laboratory W 2–4:25. Kenneth Post Laboratory. Professor Boodley.] Not given in 1969–70.

Intended to provide the latest information relative to efficient operation and administration of a commercial greenhouse range outside the sphere of actual production methods for specific crops. Consideration is given to the industry and centers of production and competition, location of the greenhouse range, types of structures, heating and ventilation, plant containers, soils and fertilizers, photoperiod control, and harvesting and postharvest handling of floriculture crops. Field trips will be taken.

Departmental Seminar

550. SPECIAL PROBLEMS IN FLORICULTURE AND ORNAMENTAL HORTICULTURE (S and U optional)

Fall or spring term. Credit one or more hours. Prerequisite, adequate training for the work; undergraduates must attach to their preregistration material written permission from the staff member who will supervise the work and assign the grade. Professor J. C. Seeley and staff.

Special work on problems under investigation by the department or of special interest to the student, provided adequate facilities are available. Students must satisfy the staff member under whom the work is to be taken that their preparation warrants their choice of problems.

600. SEMINAR (S and U Exclusive)

For departmental staff and graduate students. Fall and spring terms. Th 12:20. Plant Science 37.

Freehand Drawing and Illustration

109–110. DRAWING FOR LANDSCAPE STUDENTS (S and U optional for graduate students only)

Throughout the year. Credit three hours a term. Credit may not be received for both Course 109 and Course 111. Fall term is prerequisite to spring term. Intended primarily for departmental majors. Others may register in the fall, if space permits, with permission of the instructor. Fall term, W F 2–4:25; spring term, M W F 11:15–1:10. Mann 500. Associate Professor Lambert and Mrs. Elliot.

Planned to develop practical ability in the sketching of outdoor planting and landscape features, facility in lettering, and knowledge of isometic and perspective construction from plans and elevations. Sketchbook assignments, to be done outside class, are given throughout the year.

111. FREEHAND DRAWING (S and U optional for graduate students only)

Fall or spring term. Credit three hours. Credit may not be received for both Course 109 and Course 111. Prerequisite, permission of instructor to register. For beginning students. Lecture, Fall term, W 10:10. Spring term, T or W 10:10. Six hours of time, including the lecture period, are to be spent in the drawing room, preferably in two-hour units. These hours must be scheduled between 9:05 and 11:15 M W F in the fall term, and between 9:05 and 12:05 M T W Th F or T 2–4:25 in the spring term. Mann 500. Associate Professor Lambert and Mrs. Elliot.

The objective is to develop accuracy of observation and skill in delineation. Practice is given in outdoor sketching and in the drawing of still-life set-ups, interior scenes, and human figures. The principles of freehand perspective are

taught and applied. The course is designed to aid those who plan to work in nature study, biological sciences, and home economics. Sketchbook assignments to be done outside class are given throughout the year.

211. FREEHAND DRAWING AND ILLUSTRATION (S and U optional for graduate students only)

Fall term. Credit two hours. Prerequisite, Drawing 111 or the equivalent. Six hours of time, including one lecture period arranged during the first week, are to be spent in the drawing room, preferably in two-hour units. These hours may be scheduled between 9:05 and 12:05 M T W Th F. Mann 500. Associate Professor Lambert.

This course carries on from the object drawing of the beginning course to the organization of a complete illustration. The subject matter is derived largely from quick, on-the-spot sketches. Composition, perspective relationships, and ways of rendering are all considered. The work is planned primarily to help students who expect to use their sketching ability in landscape work, interior decorating, or the illustrating of their own papers, bulletins, and books.

214. WATER COLOR ILLUSTRATION (S and U optional for graduate students only)

Spring term. Credit two hours. Prerequisite, Course 111 or the equivalent. Six hours of practice must be scheduled, preferably in two-hour units, between 9:05 and 12:05 M T W Th F or T 2–4. Mann 500. Associate Professor Lambert.

The student learns to mix colors, lay washes, and plan the values of his composition before he tries illustration in color.

316. ADVANCED DRAWING (S and U optional)

Fall or spring term. Credit two hours. Three hours of practice required for each hour of credit. Prerequisite, Courses 110, 312, or the equivalent. Time to be arranged. Mann 500. Associate Professor Lambert and Mrs. Elliot.

For students who wish to attain proficiency in some particular type of illustration or technique.

417. SCIENTIFIC ILLUSTRATION (S and U optional)

Fall term. Credit two hours. Prerequisite, Course 211 or permission of the instructor. Six hours of practice to be scheduled, preferably in two-hour units. These hours may be scheduled between 9:05 and 12:05 M T W Th F. Mrs. Elliot.

A survey of illustration methods suitable for different scientific fields; training in the techniques of pen and ink, scratch board, stipple board, wash, and color overlays. Instruction in the use of the camera lucida, pantograph, projectscope, and other time-saving methods of getting accurate results as quickly as possible. Methods of reproducing illustrations are studied in relation to cost and problems of publication.

INTRODUCTION TO LANDSCAPE ARCHITECTURE (LANDSCAPE ARCHITECTURE 102)

ELEMENTARY LANDSCAPE ARCHITECTURAL DESIGN (LANDSCAPE ARCHITECTURE 103)

INTERMEDIATE LANDSCAPE ARCHITECTURAL DESIGN (LANDSCAPE ARCHITECTURE 232)

PLANTING DESIGN (LANDSCAPE ARCHITECTURE 332)

JUNIOR LANDSCAPE ARCHITECTURAL DESIGN (LANDSCAPE ARCHITECTURE 333)

LANDSCAPE CONSTRUCTION (LANDSCAPE ARCHITECTURE 341–342)

SENIOR LANDSCAPE ARCHITECTURAL DESIGN (LANDSCAPE ARCHITECTURE 434–435)

RECREATIONAL PLANNING (LANDSCAPE ARCHITECTURE 436)

PROFESSIONAL PRACTICE AND ETHICS (LANDSCAPE ARCHITECTURE 451)

SPECIAL PROBLEMS IN LANDSCAPE ARCHITECTURE (LANDSCAPE ARCHITECTURE 555)

FOOD SCIENCE

This department offers a curriculum leading to a Bachelor of Science degree with a specialization in dairy and food science. The curriculum includes a core of basic courses plus electives chosen to meet the specialized interest of the student. Elective courses can be chosen in chemical, physical, or engineering sciences for those planning careers in research or teaching; or in business and accounting for those interested in managerial work.

Students interested in managerial work can combine a regular four-year program with a graduate program by qualifying for the combination program in the Cornell Graduate School of Business and Public Administration. This is a five-year program which permits the student to obtain a Bachelor of Science degree at the end of the senior year and a Master of Business Administration at the end of the fifth year. The curriculum also provides opportunity for the science-minded student to prepare for graduate work in either dairy or food science.

100. INTRODUCTORY FOOD SCIENCE

Fall term. Credit three hours. Lectures, M W F 10:10. Stocking 218. Associate Professor Potter.

A survey course intended to expose the student to the broad field of food science and technology, its scope, principles, and practices. Lectures will deal with the constituent properties of foods, methods of food preservation, the major food groups, including their handling and processing, and current problems such as chemical additives and world feeding needs. Throughout the course the interrelationships between sanitation, processing, nutrition, and food quality will be stressed.

210. PROPERTIES, STANDARDS, AND ANALYSIS OF FOODS

Spring term. Credit three hours. Prerequisite, Chemistry 104 or 108. Lectures, T Th 12:20. Stocking 120. Laboratory, F 2–4:25. Stocking 209. Professor Shipe and assistants.

The lecture portion of the course deals with the general properties of fats, proteins, carbohydrates, minerals, and vitamins and their specific effects on the properties of foods. Food standards and methods of analysis are

discussed. The laboratory portion of the course is designed to acquaint the student with a variety of qualitative and quantitative tests used by the food analyst.

MEAT AND MEAT PRODUCTS (Animal Science 290)

[302. DAIRY AND FOOD ENGINEERING

Fall term. Credit four hours. Given in alternate years. Prerequisite, Physics 101 and 102 or the equivalent and Course 100. Lectures, M W F 10:10. Laboratory, M 2–4:25. Stocking 119. Professor Jordan.] Not given in 1969–70.

Engineering aspects of dairy and food plant operations.

303. LIPID TECHNOLOGY

Fall term. Credit three hours. Given in alternate years. Open to upperclassmen and graduate students. Lecture demonstrations, W F 9:05. Stocking 120. Laboratory practice, F 1:25–4:25. Stocking 209. Assistant Professor Kinsella.

Sources, processing and properties of edible fats and oils are covered. Using both lectures and experiments, factors affecting the physical properties and chemical composition of fatty foods are demonstrated. All classes of lipids are considered, and their functions in food chemistry are described.

304. DAIRY ADMINISTRATION

Fall term. Credit two hours. Given in alternate years. Prerequisite, Course 314. Lecture, W 12:20. Laboratory, W 2–4:25. Stocking 120. Mr. Hoefer.

A study of dairy plant forms and records used in inventory control and the preparation of Market Administration reports.

310. SENSORY QUALITIES AND EVALUATIONS OF FOODS

Spring term. Credit two hours. Open to upperclassmen and graduate students. Prerequisites, Food Science 210 or equivalent, and a course in statistics. T Th 8:30–9:55. Stocking 120. Professor Shipe and assistants.

Deals with the factors affecting the color, odor, flavor, and texture of foods and the evaluation of these qualities. The techniques and interpretations of both objective and subjective evaluations are discussed. The laboratory exercises involve the evaluation of a variety of foods.

[311. CONCENTRATED, DEHYDRATED, AND FROZEN FOODS

Spring term. Credit four hours. Given in alternate years. Lectures, M W 11:15–1:00. Laboratory, M 1:40–4:30. Stocking 120. Professor Jordan and Associate Professor Potter.] Not given in 1969–70.

Deals with the principles and practices of condensing, drying, and freezing food materials. Such aspects as raw material selection, preparation, processing unit operations, packaging, and storage properties of foods will be considered in the light of current processing methods, and as related to the chemistry, microbiology, and technology of the ingredients and final products.

[313. STERILIZATION PROCESS

Spring term. Credit three hours. Given in alternate years. Prerequisites, Chemistry 353 or equivalent, Biological Sciences 394, and Physics 102. Recommended, a course in calculus and a course in biochemistry. Lectures, M W 10:10. Discussion, F 10:10. Riley-Robb 225. Laboratory, W 2–4:25. Riley-Robb 44. Associate Professor Buck.] Not given in 1969–70.

The principles of food preservation and the fundamentals of food processing from raw materials to finished product. Heat transfer, unit operations, and unit processes employed by the canning industry will be emphasized, but

sterilization by any means such as heat, chemicals, physical destruction, and filtration will be demonstrated. The effects of lethal energy treatment of biological fluids and systems on desirable components such as nutritive factors and flavor components will be considered along with the cost of operation. The laboratory involves actual participation in plant operations in the processing and preservation of various food products, and field trips.

[314. MILK AND FOOD SANITATION AND PLANT OPERATIONS

Fall term. Credit four hours. Given in alternate years. Prerequisites, Course 100 and Biological Sciences 394. Lectures, T Th 12:20. Recitation to be arranged. Laboratory, T 1:25–4:25. Professor White and assistants.] Not given in 1969–70.

The biological and chemical control of milk and food processing. Federal, state, and local requirements for the production, collection, and processing of milk and food. The control of sanitation, composition, and production in the food plant is outlined with special attention given to the fluid milk industry.

APPLIED AND INDUSTRIAL MICROBIOLOGY (BIOLOGICAL SCIENCES 393)

DAIRY AND FOOD MICROBIOLOGY (BIOLOGICAL SCIENCES 394)

400. RESEARCH

Fall or spring term. Credit one or more hours by arrangement. Undergraduates must attach to their preregistration material written permission from the staff member who will supervise the work and assign the grade. Staff.

Special problems in any phase of food science may be elected.

401. FOOD FROM FERMENTATIONS

Fall term. Credit five hours. Given in alternate years. Prerequisite, beginning courses in microbiology and organic chemistry or biochemistry are recommended. Lectures and laboratories, T Th 11:15–4:25. Professor Kosikowski and Assistant Professor Ledford.

The chemistry, microbiology, and technology of processes leading to important foods such as cultured milks, cheeses, wines, and beers. Consideration is given also to other fermentations resulting in high-protein foods from plant and animal sources, including those from petroleum and whey.

Line-flow processing and testing practices designed to acquaint students with the principles of fermentations and production of the above foods are carried out in the laboratory.

403. INTERNATIONAL FOOD DEVELOPMENT

Fall term. Credit three hours. Given in alternate years. M W 2–4:25. Stocking 119. Professor Kosikowski.

A study of programs, technical problems, and progress associated with developing, processing and marketing acceptable food supplies in critical world areas. Proposals for increasing world protein resources for the human are to be discussed. Special attention is to be directed to the organization, operations, relationships, and contributions of U.N. technical agencies, FAO, UNICEF, WHO, and governmental and nongovernmental organizations in the field.

[404. CHEMISTRY OF MILK

Fall term. Credit three hours. Given in alternate years. Prerequisites, quali-

tative and quantitative analysis and organic chemistry. Hours by arrangement. Stocking 120. Assistant Professor Ledford.] Not given in 1969–70.

A study of milk constituents and physical properties. Deals with milk enzymes, lactose, milk fat, milk proteins, and minor constituents.

[410. FOOD BIOCHEMISTRY

Fall term. Credit three hours. Given in alternate years. Prerequisite, Biological Sciences 431. Lectures, M W F 9:05. Stocking 119. Assistant Professor Kinsella.] Not given in 1969–70.

A discussion of some of the important nonmicrobial changes in foods, such as denaturation and the Maillard browning reaction. Emphasis is placed on the occurrence, significance, and prevention or control of the changes as they affect the color, odor, flavor, texture, or nutritive value of foods. The chemistry of the various constituents of foods is considered and their interactions during processing and storage are discussed. Specific foods are considered in detail by specialized personnel. The roles of chemical interactions and also, of food additives in improving the quality of foods are described.

412. AQUATIC MICROBIOLOGY

Spring term. Credit three hours. Given in alternate years. Prerequisite, introductory bacteriology (Biological Sciences 290 or equivalent, or Soil Science 306). Hours by arrangement. Professor Dondero.

A consideration of the relation of microorganisms, especially the bacteria, to aquatic environments, both natural and artificial. The microbiology of waste waters will be included. Attention will be given to fundamental biological concepts and to applied aspects of the occurrence and activities of microorganisms in waters.

[413. ANALYTICAL METHODS

Spring term. Credit four hours. Given in alternate years. Prerequisite, Course 210, one term of either organic chemistry or biochemistry. Lectures, T Th 11:15. Stocking 119. Laboratory, Th 1:25–4:55. Stocking 209. Assistant Professor Sherbon.] Not given in 1969–70.

A study of the analytical methods important to the food industry. The emphasis is on understanding the basic analytical chemistry applied in the various tests. General topics include sampling, gravimetric and volumetric methods, optical methods, electrochemistry, and the use of basic statistics.

512. INSTRUMENTAL METHODS

Spring term. Credit five hours. Given in alternate years. Prerequisite, Course 413 or permission of the instructor. Lectures, M W F 11:15. Stocking 120. Laboratory, M or T 1:25–4:55. Stocking 209. Assistant Professor Sherbon.

Deals with instrumental methods widely used in research and industry. The major emphasis is on chromatography, spectroscopy, electrophoresis, ultracentrifugation, thermal analysis, and the use of computers. The stress will be on the practical use of the material presented.

514. THE BIOCOLLOIDAL CHEMISTRY OF FOODS

Spring term. Credit three hours. Given in alternate years. Prerequisites, Biological Sciences 431 and 433, or the equivalent. Lectures, M W 10:10. Discussion, F 2:30. Stocking 119. Laboratory, W 2–4:25. Stocking 209. Associate Professor Buck.

The principles of the science of colloidal systems and micelles of importance in biology and agriculture will be introduced; then the amiscropic morphology of cytoplasm, cell walls, plastids, biological gels, and sols will be

studied and the data applied to food. Polysaccharides and polypeptides in chain molecules which sometimes reach microscopical lengths will be intensively studied. Especial attention will be given to the structural arrangement of complex polymers. The physical chemistry of surfaces (including adsorption, ion-exchange and electric double layer), flocculation, viscosity, swelling, and gel formation will be discussed.

600. SEMINAR

Fall and spring terms. Attendance required of all food science graduate students on the Cornell campus, and all dairy science students, at seminars sponsored by their respective fields.

MEAT CUTTING (ANIMAL SCIENCE 293)

SELECTION, GRADING, AND PURVEYING OF MEAT (ANIMAL SCIENCE 394)

MEAT TECHNOLOGY (ANIMAL SCIENCE 490)

POST HARVEST PHYSIOLOGY, HANDLING, AND STORAGE OF FRUITS (POMOLOGY 201)

POULTRY MEAT AND EGG TECHNOLOGY (POULTRY SCIENCE 450)

HANDLING AND MARKETING OF VEGETABLES (VEGETABLE CROPS 212)

POTATO PRODUCTION AND PROCESSING (VEGETABLE CROPS 222)

HANDLING AND MARKETING OF VEGETABLES, ADVANCED COURSE (VEGETABLE CROPS 412)

MARKETING (AGRICULTURAL ECONOMICS 240)

MARKETING MILK AND DAIRY PRODUCTS (AGRICULTURAL ECONOMICS 346)

INTERNATIONAL AGRICULTURE

600. SEMINAR: INTERNATIONAL AGRICULTURAL DEVELOPMENT

Fall and spring terms. No credit. Third and fourth Wednesdays, 4:30–5:30. Plant Science 404. Professor Turk and staff.

Primarily for graduate students interested in an integrated view of problems related to international agricultural development. Undergraduates with a specialization in international agriculture are encouraged to attend without registering. The seminar will focus on developing an understanding of the nature and interrelatedness to agricultural development of the social sciences, plant and animal sciences, foods and nutrition, and natural resources.

601. SEMINAR ON AGRICULTURAL DEVELOPMENT IN THE PHILIPPINES

Spring term. Credit two hours. Th 4:30–6:00. Roberts 131. Professors Golay and Levine.

Major aspects of Philippine agricultural development will be considered from economic, social, and technological points of view.

ECONOMICS OF AGRICULTURAL DEVELOPMENT (AGRICULTURAL ECONOMICS 464)

ECONOMIC ASPECTS OF THE WORLD'S FOOD (AGRICULTURAL ECONOMICS 560)

SEMINAR IN AGRICULTURAL POLICY (AGRICULTURAL ECONOMICS 651)

SEMINAR ON THE AGRICULTURAL DEVELOPMENT OF SOUTH ASIA (AGRICULTURAL ECONOMICS 664)

SEMINAR ON LATIN AMERICAN AGRICULTURAL POLICY (AGRICULTURAL ECONOMICS 665)

SEMINAR ON THE ECONOMICS OF TROPICAL AGRICULTURE (AGRICULTURAL ECONOMICS 667)

SEMINAR IN THE ECONOMICS OF AGRICULTURAL DEVELOPMENT (AGRICULTURAL ECONOMICS 668)

LOW-COST ROADS (AGRICULTURAL ENGINEERING 491)

IDENTIFICATION, APPRAISAL, AND GEOGRAPHY OF SOILS (AGRONOMY 301)

GEOGRAPHY AND APPRAISAL OF SOILS OF THE TROPICS (AGRONOMY 401)

TROPICAL AGRICULTURE (AGRONOMY 422)

SPECIAL STUDIES IN SOILS OF THE TROPICS (AGRONOMY 481)

LIVESTOCK PRODUCTION IN THE TROPICS (ANIMAL SCIENCE 400)

SPECIAL STUDIES IN LIVESTOCK OF THE TROPICS (ANIMAL SCIENCE 401)

INTERNATIONAL COMMUNICATION (COMMUNICATION ARTS 501)

COMMUNICATION IN DEVELOPING NATIONS (COMMUNICATION ARTS 524)

INTERNATIONAL NATURE CONSERVANCY (CONSERVATION 511)

DESIGNING PROGRAMS OF DEVELOPMENTAL CHANGE (EDUCATION 524)

COMMUNICATING TECHNOLOGY (EDUCATION 525)

SEMINAR: COMPARATIVE EXTENSION EDUCATION SYSTEMS (EDUCATION 626)

SEMINAR: IMPLEMENTING EXTENSION AND COMMUNITY DEVELOPMENT PROGRAMS IN DEVELOPING COUNTRIES (EDUCATION 627)

INTRODUCTORY PARASITOLOGY (ENTOMOLOGY 351)

ADVANCED PARASITOLOGY (MEDICAL ENTOMOLOGY) (ENTOMOLOGY 552)

INTERNATIONAL FOOD DEVELOPMENT (FOOD SCIENCE 403)

INTERNATIONAL NUTRITION PROBLEMS, POLICIES, AND PROGRAMS

(See the *Announcement of the Graduate School of Nutrition.*)

INTERNATIONAL CROP BREEDING AND IMPROVEMENT (PLANT BREEDING 506)

PLANT DISEASES IN TROPICAL AGRICULTURAL DEVELOPMENT (PLANT PATHOLOGY 655)

ECONOMIC FRUITS OF THE WORLD (POMOLOGY 301)

RURAL SOCIETY (RURAL SOCIOLOGY 412)

COMPARATIVE RURAL SOCIETIES (RURAL SOCIOLOGY 420)

OCCUPATIONAL STRUCTURE IN INDUSTRIAL AND DEVELOPING COUNTRIES (RURAL SOCIOLOGY 424)

CROSS-CULTURAL RESEARCH METHODS (RURAL SOCIOLOGY 516)

APPLICATIONS OF SOCIOLOGY TO DEVELOPMENT PROGRAMS (RURAL SOCIOLOGY 528)

SEMINAR IN CONTEMPORARY THEORIES OF PLANNED SOCIAL CHANGE (RURAL SOCIOLOGY 630)

SEMINAR IN SOCIAL CHANGE AND DEVELOPMENT (RURAL SOCIOLOGY 636)

SPECIAL TOPICS IN PLANT SCIENCE EXTENSION (VEGETABLE CROPS 429)

LANDSCAPE ARCHITECTURE

The Department of Floriculture and Ornamental Horticulture through its Division of Landscape Architecture offers a four-year curriculum in landscape architecture. The student is trained in the use of land, water, and plant and structural forms for efficient, safe, and pleasant use. He learns how to collaborate with the other planning professions. In addition to general and technical courses taught in the classroom, the student makes supervised inspection trips to view examples of professional landscape architecture and, also, is required to obtain a specified amount of approved practical experience during the summer months. The landscape architecture curriculum leads to the Bachelor of Science degree with a specialization in landscape architecture.

102. INTRODUCTION TO LANDSCAPE ARCHITECTURE

Fall or spring term. Credit three hours. Lectures, fall term, M W F 8; spring term, M W F 8. East Roberts 222. Mr. Dwelle.

A consideration of the principles of landscape architecture as applied to the small-residence property.

103. ELEMENTARY LANDSCAPE ARCHITECTURAL DESIGN

Fall term. Credit one hour. Prerequisites, Drawing 109 or 111 and Course 102, which may be taken concurrently with Course 103. Intended primarily for departmental majors. Laboratory, Th 2–4:25. Plant Science 433. Associate Professor Scannell.

Principles of design, with practice in the use of drawing instruments and graphic interpretation of ideas.

232. INTERMEDIATE LANDSCAPE ARCHITECTURAL DESIGN

Spring term. Credit three hours. Prerequisites, Courses 103, 213, 312, and Freehand Drawing 110. Lecture, M 11:15. Laboratories, T Th 10:10–12:35. Plant Science 433. Mr. Dwelle.

The application of the principles of design to the specific problems of the small residential property as well as other small-scale landscape architectural problems. A terminal course for those not intending to major in this field.

332. PLANTING DESIGN

Fall term. Credit three hours. Prerequisite, Course 232. Lecture, W 12:20. Laboratories, W F 2–4:25. Plant Science 433. Mr. Dwelle.

An advanced course in design with emphasis on plant combinations and uses in association with structure and gardens. Practice in drawing and estimating planting plans.

333. JUNIOR LANDSCAPE ARCHITECTURAL DESIGN

Spring term. Credit four hours. Prerequisite, Course 232. Lecture, M 12:20. Laboratories, M W Th 2–4:25. Plant Science 433. Associate Professor Scannell.

Practice in making landscape architectural plans for actual situations is an essential part of this course. Industrial and commercial landscape architectural treatments are included.

341–342. LANDSCAPE CONSTRUCTION

Throughout the year. Credit three hours a term. Prerequisite, Civil Engineering 2452. Fall term is prerequisite to spring term. Fall term: lecture, T 9:05. Laboratories, M Th 2–4:25. Spring term: lectures and laboratories, W F 10:10–12:35. Plant Science 433. Assistant Professor Carpenter.

Theory and drafting room practice in interpretation and preparation of grading, detailed construction drawings, and small structural design; study of highway and road alignment, and landscape hydraulics. Emphasis on surveying applications, earthwork, drainage and structural systems, materials, engineering mathematics, material take-offs, and cost analysis.

434–435. SENIOR LANDSCAPE ARCHITECTURAL DESIGN

Throughout the year. Credit four hours a term. Prerequisite, Course 333. Fall term is prerequisite to spring term. Lecture, W 12:20. Laboratories, M W Th 2–4:25. Plant Science 433. Associate Professor Scannell and Assistant Professor Carpenter.

A succession of landscape architectural problems of an increased degree of complexity. Included will be problems involved in the design of institutions, resort areas, industrial complexes, and other similar areas.

436. RECREATIONAL PLANNING

Spring term. Credit three hours. Prerequisite, Course 333. One lecture and two laboratories. Time to be arranged. Plant Science 433. Associate Professor Scannell.

Theory of recreational planning and design with a study of the design, construction details, and other working drawings for recreational areas of all sizes.

451. PROFESSIONAL PRACTICE AND ETHICS

Fall term. Credit two hours. Prerequisite, Course 342. Lecture, T 12:20. Laboratory, T 2–4:25. Plant Science 433. Assistant Professor Carpenter.

An extensive coverage of methods used in the professional practice of landscape architecture together with approved office procedure. Problems inherent with office practice and solutions to these problems will be covered.

555. SPECIAL PROBLEMS IN LANDSCAPE ARCHITECTURE

Fall or spring term. Credit one or more hours. Prerequisite, adequate training for the work, and permission of the staff member who will supervise the work. Associate Professor Scannell and staff.

Special work on problems of interest to the student.

METEOROLOGY

201. BASIC PRINCIPLES OF METEOROLOGY

Fall term. Credit three hours. Lectures, T Th 11:15. Bradfield 101. Laboratory, T W or Th 2–4:25. Bradfield 1102. Associate Professor Dethier.

Simplified treatment of structure of the atmosphere; heat balance of the earth; general and secondary circulations; air masses, fronts, and cyclones; hurricanes; thunderstorms, tornadoes, and atmospheric condensation. In the laboratory, emphasis is on the common meteorological instruments and the weather map.

202. CLIMATOLOGY

Spring term. Credit three hours. Prerequisite, Course 201. Lectures, M W F 11:15. Bradfield 110. Associate Professor Dethier.

The first ten weeks are devoted to the description of world climates in terms of the global distribution of radiation, temperature, pressure, and wind, precipitation and air masses, and the factors which produce this distribution.

During the last five weeks of study, emphasis is on the factors influencing the microclimate and the variation of climate due to vegetation and small-scale topographic features.

331. TROPICAL METEOROLOGY

Spring term. Credit three hours. Given in alternate years. Prerequisite. Course 201 or 411. Lectures, M W F 9:05. Bradfield 105. Associate Professor Dethier.

A study of the general circulation of the tropics, easterly waves, hurricanes, monsoons, and local diurnal tropical weather phenomena.

411. INTRODUCTORY DYNAMIC METEOROLOGY

Fall term. Credit three hours. Prerequisites, one year each of calculus and physics. Lectures, M W F 8. Bradfield 1102. Assistant Professor Knapp.

Properties of air, hydrostatic stability and convection, radiation in the earth's weather system, and atmospheric circulations.

412. INTERMEDIATE DYNAMIC METEOROLOGY

Spring term. Credit three hours. Prerequisite, Course 411 or permission of instructor. M W F 8. Bradfield 1102. Assistant Professor Knapp.

Consideration of the atmospheric part of the earth's weather system. Review of attempts to find the governing relations in useful form, and to identify, measure, and compute the significant parameters.

[413. MICROMETEOROLOGY

Fall term. Credit three hours. Given in alternate years. Prerequisites, one year each of calculus and physics. T Th 8 and F 1:25. Bradfield 1102. Assistant Professor Knapp.] Not given in 1969–70.

Weather and climate near the ground, considered from the local point of view. Interaction of plants and their local physical environment.

414. THEORETICAL CLIMATOLOGY

Fall term. Credit three hours. Given in alternate years. Prerequisite, permission of instructor. T Th 8 and F 1:25. Bradfield 1102. Assistant Professor Knapp.

Mathematical models of large-scale and long-term characteristics of the earth's weather system. Some consideration of atmospheres of other planets and theories of climatic change.

[415. HYDROMETEOROLOGY

Spring term. Credit three hours. Given in alternate years. Prerequisite, one year of calculus and physics. Lectures, M W F 9:05. Bradfield 105. Professor Dethier.] Not given in 1969–70.

Atmospheric part at the hydrologic cycle—evaporation, precipitation and transport.

462. UNDERGRADUATE RESEARCH IN METEOROLOGY

Fall and spring terms. Credit one to three hours. Required of honor students in the physical sciences majoring in meteorology. Staff.

550. SPECIAL TOPICS IN METEOROLOGY AND CLIMATOLOGY

Fall or spring term. Credit one or more hours. Undergraduates must attach to their preregistration material, written permission from the staff member who will supervise the work and assign the grade. Staff.

Study of meteorological topics more advanced than or different from those in other courses. Subject matter depends on the background and desires of those enrolling.

562. RESEARCH IN METEOROLOGY

Fall and spring terms. Credit one or more hours. Thesis research. Staff.

691. SEMINAR IN METEOROLOGY

Prerequisite, permission of the professor in charge. Associate Professor Dethier.

Subjects for future times may be such things as weather modification, paleoclimatology, atmospheric pollution. These will be planned and announced in advance.

PLANT BREEDING AND BIOMETRY

Four-year students interested in specializing in genetics, plant breeding, or statistics may obtain suggested sequences of courses by consulting the head of the department or other members of the faculty. Professional careers in these fields ordinarily involve advanced study. Therefore, undergraduate

course work in most instances will be directed toward preparation for graduate study. Appropriate fundamental courses in biology, mathematics, chemistry, and English will make up the bulk of the curriculum.

During summers of alternate years, a series of field trips is scheduled to give students an opportunity to visit commercial seed farms, wholesale seed companies, the New York State Department of Agriculture and Markets, USDA at Beltsville, a plant introduction station, a foundation and certified seed agency, and the Farmers Museum at Cooperstown.

Plant Breeding

503. METHODS OF PLANT BREEDING I

Fall term. Credit three hours. Primarily for graduate students, but open to properly qualified seniors who expect to engage in plant breeding. Prerequisites, Biological Sciences 101–102 or 103–104 and 281, and a course in at least one of the following: field crops, vegetable crops, floriculture, or pomology. Lectures, T Th 8. Bradfield 108. Laboratory, T 2–4:25. Professor Murphy.

A study of the principles and practices of plant breeding. Each of the possible variety forms is described, and the methods of producing them are discussed.

504. APPLIED METHODS AND TECHNIQUES I (S and U exclusive)

Fall term. Credit two hours. Given in alternate years. Prerequisites, Course 503 or permission of the instructor. Lecture, Th 9:05. Bradfield 110. Laboratory, Th 1:25–4:25. Associate Professor Crowder and staff.

Designed to acquaint students with the field, greenhouse, and laboratory techniques used in plant breeding research. Will include experience with modes of pollination, male sterility and incompatibility factors, immunology, polyploidy, chemical mutagens and ionizing radiation as related to higher plants, in vitro embryo culture, seed dormancy, viability, processing, etc.

[505. APPLIED METHODS AND TECHNIQUES II. (S and U exclusive)

Fall term. Credit two hours. Given in alternate years. Prerequisite, Course 503 (or taken concurrently). Lecture, Th 9:05. Bradfield 105. Laboratory, Th 1:25–4:25. Associate Professor Wallace and Staff.] Not given in 1969–70.

Familiarization and exercises with laboratory and greenhouse equipment, methods and procedures used in plant breeding research. Will include experience with protein, amino acid, and other constituent analyses; color, pigment, sugar, and physical differences; conduct of taste panels; use of growth chambers; creation of disease epyphytotics; computer analysis, etc.

506. INTERNATIONAL CROP BREEDING AND IMPROVEMENT

Spring term. Credit two hours. Given in alternate years. Prerequisite, Course 503 or consent of the instructors. Lecture, T 9:05. Discussion, T 2:30–4:25. Bradfield 105. Professors Crowder and MacDonald.

Discussion of plant breeding principles and procedures that have been evolved and applied in breeding certain groups of crops based on mode of pollination and the predominant type of gene action, especially as related to situations found in different parts of the world. Particular attention will be given to alternate approaches in breeding and crop improvement programs in developing countries and to cropping systems and agronomic practices which influence crop productivity. Specific reference materials

and examples will be drawn from current activities in tropical agricultural regions. Student participation is expected.

507. RESEARCH ORIENTATION

Spring term. Credit two hours. Admittance by consent of the instructor. Lectures, M W F 9:05 for the first ten weeks of the semester. Bradfield 108. Professor Grogan and Staff.

Designed to acquaint the student with the various facets of research in plant breeding. Particular attention will be given to the organizations engaged in plant breeding, sources and kinds of support, preparation of project outlines and reports, the philosophies of selected past and present plant breeders, real and hypothetical research problems, varietal release procedures and policies, preparation of a publication, aids in oral presentation, and seeking a position.

[512. EXPERIMENTAL METHODS

Spring term. Credit two hours. Given in alternate years. Prerequisite, Course 511 or consent of instructor. Lectures, M W F 12:20. Bradfield 105. Professor Lowe.] Not given in 1969–70.

Use of statistical methods and application of experimental designs and plot techniques to problems in plant breeding and related agricultural research.

515. METHODS OF PLANT BREEDING II

Spring term. Credit two hours. Given in alternate years. Prerequisites, Course 503 and Statistics & Biometry 511, or equivalent. Lectures, M W F 8, first ten weeks of semester. Bradfield 105. Professors Plaisted and Jensen, and Assistant Professor Rutger.

An introduction to quantitative genetics and its application to the understanding of various plant breeding and selection procedures. Topics covered will be the estimation and understanding of coefficients of inbreeding, genetic components of variation, heritability, general and specific combining ability, and genetic advance. Special attention is given to the development and utilization of populations with maximum genetic diversity.

450. SPECIAL PROBLEMS IN RESEARCH

Fall, spring, or summer. Credit one or more hours by arrangement with instructor. Undergraduates must attach to their preregistration material, written permission from the staff member who will supervise the work and assign the grade. Members of the departmental staff.

622. SEMINAR

Fall and spring terms. Without credit. T 12:30. Emerson Seminar Room. Members of the departmental staff and graduate students.

PLANT PATHOLOGY

The department offers programs of instruction in plant pathology, mycology, plant nematology, plant virology, phytobacteriology, dendropathology, and disease physiology. In consultation with an adviser, a student may develop a program to prepare himself for (1) graduate work leading to a career in teaching or research, (2) training as a laboratory or research technician, (3) a career in state and federal regulatory work or as a county agent, or (4) a

career in agricultural chemical sales or technical service. An undergraduate major in the field is not required for graduate work in mycology or plant pathology.

301. ELEMENTARY PLANT PATHOLOGY

Every fall and alternate spring terms. Credit three hours. Prerequisite, Biological Sciences 101–102 or 103–104, or the equivalent. Lectures, T Th 11:15. Plant Science 37. Laboratory, T W Th or F 2–4:25. Plant Science 341. Conferences to be arranged. Professor Boothroyd.

An introductory course dealing with the nature, cause, and control of disease in plants. Representative diseases of cultivated crops are studied in the laboratory.

302. PLANT DISEASE CONTROL PRACTICES

Spring term. Credit three hours. Given in alternate years. Prerequisite, Course 301 or equivalent. Lecture, T 11:15. Plant Science 336. Laboratories and recitation, T Th 2–4:25. Plant Science 342. Professor to be appointed.

For undergraduates who expect to engage in general farming, fruit, vegetable, cereal, or ornamental growing, in agricultural agent work, or in teaching of agriculture in secondary schools. Consideration is given to modern methods for controlling diseases of plants through production and use of disease-free propagative materials, seed treatments, regulatory laws, crop rotation, plant surgery, sanitation, soil treament, spraying and dusting. and development and use of disease resistant varieties. Field trips arranged to observe disease control practices.

309. COMPARATIVE MORPHOLOGY OF FUNGI

Fall term. Credit four hours. Prerequisite, a year sequence of Botany or its equivalent, and permission to register. Lecture, T Th 9:05. Plant Science 336. Laboratory, T Th 1:25–4:25. Plant Science 326. Professor Korf and Associate Professor Lorbeer.

An introductory course in mycology. Emphasis is placed on morphology rather than on taxonomy.

401. BIOLOGICAL ASPECTS OF PLANT DISEASE

Spring term. Credit four hours. Given in alternate years. Prerequisites, Biological Sciences 101–102 or 103–104 or the equivalent, introductory chemistry, and permission to register. Primarily for juniors and seniors. Lectures, T Th 11:15. Plant Science 422. Laboratory, T Th 2–4:25. Plant Science 341. Associate Professor Millar.

Examines the etiological, cytological, physiological, biochemical, genetical, ecological, entomological, epidemiological, and sociological aspects of disease. In the laboratory emphasis is on illustration of these aspects through experimentation utilizing fungi, bacteria, nematodes, viruses, and insects.

403. PATHOLOGY OF TREES AND SHRUBS

Spring term. Credit three hours. Prerequisite, Course 301 or the equivalent. Lectures, W F 10:10. Plant Science 336. Laboratory, F 1:25–4:25. Plant Science 342. Associate Professor Sinclair.

For students desiring some specialized knowledge of diseases of trees and shrubs in preparation for nursery or landscape work, for careers as park superintendents, arborists, or city foresters, or for other horticultural professions; dealing with the nature, recognition, diagnosis, and treatment of diseases of woody plants.

431. UNDERGRADUATE RESEARCH IN MYCOLOGY OR PLANT PATHOLOGY (S and U exclusive)

Fall or spring term or both. Credit three to five hours. Undergraduates must attach to their preregistration material written permission from the staff member who will supervise the work and assign the grade. Not less than three laboratories of three clock hours per week. Staff members.

Designed to afford opportunity for selected undergraduates to test their inclinations and ability to do research work. The student is expected to prosecute with interest and enthusiasm, under informal direction of the professor, some problem or problems mutually agreed upon.

501. ADVANCED PLANT PATHOLOGY

Fall term. Credit four hours. Prerequisite, a course in introductory plant pathology and permission to register. Lecture, T Th 11:15. Plant Science 336. Laboratory, T Th or W F 2–4:25. Plant Science 342. Associate Professor Millar.

Designed to acquaint the student with the basic principles and techniques of the science of phytopathology and to provide an adequate foundation for successful prosecution of research in this field.

[502. PRINCIPLES OF PLANT DISEASE CONTROL

Spring term. Credit three hours. Given in alternate years. Graduate students only. Enrollment limited to twenty-four. Prerequisite, Course 501 or its equivalent and permission to register. Lecture, T 11:15. Plant Science 336. Laboratory and discussion, T Th 2–4:25. Plant Science 342. Professor to be appointed.] Not given in 1969–70.

For graduate students who expect to teach and/or perform research in educational institutions, experiment stations, or agricultural chemical companies in connection with the development and use of plant disease control materials and methods. Emphasis is placed upon the philosophies underlying the four principles of plant disease control; exclusion, eradication, protection, and immunization. Attention is given to the existing body of knowledge upon which present disease control practices are based. Objectives are to help the student interested in plant protection equip himself not only to apply existing methods and materials but to enable him to improve upon them by developing new ideas, etc., especially in situations where control of plant diseases requires new approaches.

505. PLANT VIROLOGY

Fall term. Credit three hours; in special cases, permission may be obtained to enroll for lectures only (two hours credit). For graduate students with majors or minors in plant pathology; also open to graduate students interested in general virology. Prerequisite, Course 501 or permission to register. Lectures, T Th 10:10. Plant Science 336. Laboratory, F 1:25–4:25. Virology-Nematology Laboratory. Professor Ross.

Designed to provide advanced graduate students with basic information on the plant viruses and on the diseases they cause.

506. PLANT NEMATOLOGY

Spring term. Credit three hours. Given in alternate years. For graduate students with majors or minors in plant pathology and, in special cases, other students interested in nematology. Prerequisite, Course 501 or permission to register. Two lectures and one or two three-hour laboratory periods per week. Hours to be arranged. Lectures, Plant Science 336. Laboratory, Virology-Nematology Laboratory. Professor Mai.

Anatomy, morphology, and taxonomy of plant parasitic forms and non-

parasitic soil-inhibiting forms of nematodes are studied. Plant pathogenic forms also are considered from the standpoint of host-pathogen relationships, host ranges, life cycles, and the symptoms they cause. Principles and methods of control are discussed.

[507. BACTERIAL PLANT PATHOGENS

Spring term. Credit two hours. Given in alternate years. For graduate students with majors or minors in plant pathology; others by permission only. Prerequisite, Course 501 or permission to register. Lecture, F 9:05. Plant Science 336. Laboratory, F 2–4:25. Plant Science 304B. Associate Professor Dickey.] Not given in 1969–70.

Designed to provide students with basic information on bacterial plant diseases and phytopathogenic bacteria. The laboratory will include some of the more important techniques used in the study of bacterial plant pathogens.

508. DISEASE AND PATHOGEN PHYSIOLOGY

Fall term. Credit three hours. Given in alternate years. For graduate students with majors or minors in plant pathology; others by permission only. Prerequisites, Course 501, Biological Sciences 431, and permission to register. Lecture, F 9:05. Plant Science 336. Laboratory, F 1:25–4:25 and one to be arranged. Plant Science 344. Associate Professor Bateman.

Designed to provide students with insight into the mechanisms of pathogenesis and altered metabolism of diseased plants.

531. SPECIAL PROBLEMS IN MYCOLOGY OR PLANT PATHOLOGY

Fall or spring term, or both. Credit three or five hours each term. For graduate students only. Registration by permission. Three to five weekly laboratory periods of three hours each. Staff members.

For work in mycology, modern techniques and experimental approach are stressed, in areas such as physiology, developmental morphology, genetic systems, or cytotaxonomy.

For work in plant pathology for minor thesis or problems, or for students wishing to develop familiarity with modern techniques in some phase of the science.

For work in plant nematology, research projects in five areas are stressed. These areas include host-parasite relations, virus transmission, nematode-fungus-bacterium relations, biology, behavior, population dynamics, reproduction and growth, morphology, taxonomy, techniques, and control.

541. PHILOSOPHY OF PLANT PATHOLOGY (S and U exclusive)

Fall term. Credit two hours. Given in alternate years. For Ph.D. students majoring in plant pathology. Prerequisites, Courses 501, 579, and at least two other courses from 502, 505, 506, 507, and 508, or permission to register. Conferences, M W 8–10. Plant Science 422. Professor Kent.

A conference with advanced graduate students examining the concepts of plant pathology as they relate to the approach to basic and applied research problems, teaching, and extension.

569. ADVANCED MYCOLOGY

Fall term. Credit three hours. Given in alternate years. Prerequisites, Course 309 or its equivalent, a course in genetics, and permission to register. Lecture, M 10:10. Plant Science 336. Laboratory, M W 1:25–4:25. Plant Science 326, Professor Korf.

Part of a three-course sequence (569, 579, and 589) designed especially for students specializing in mycology or plant pathology. Each course is inde-

pendent, and the sequence may be taken in any order. Emphasis is placed on taxonomy, but other aspects of mycology are embraced. Practice in identification of specimens is stressed, as is critical evaluation of keys and monographs. Field work is *required*. Higher Basidiomycetes are covered in detail.

579. ADVANCED MYCOLOGY

Spring term. Credit four hours. Given in alternate years. Prerequisite, Course 309 or its equivalent, a course in genetics, and permission to register. Lecture, M 10:10. Plant Science 336. Laboratory, M W 1:25–4:25 and one additional 3-hour period to be arranged. Plant Science 326. Professor Korf.

Part of a three-course sequence (569, 579, and 589) described under 569. Emphasis is placed on taxonomy and on mechanisms of variation in fungi. Optional field trips will be announced. Rusts, smuts, Phycomycetes, and Fungi Imperfecti are covered in detail.

[589. ADVANCED MYCOLOGY

Fall term. Credit three hours. Given in alternate years. Prerequisite, Course 309 or its equivalent, a course in genetics, a course in plant or animal taxonomy, and permission to register. Lecture, M 10:10. Plant Science 336. Laboratory, M W 1:25–4:25. Plant Science 326. Professor Korf.] Not given in 1969–70.

Part of a three-course sequence (569, 579, and 589) described under 569. Emphasis is placed on taxonomy and taxonomic methods, and on nomenclature. Field work is *required*. Ascomycetes are covered in detail.

645–655. CURRENT TOPICS

Fall and spring terms. Credit to be arranged. For graduate students with special interests in the particular area. Prerequisite, permission to register. Time to be arranged. Plant Science 422.

Weekly discussions of current topics in special areas of plant pathology and mycology. Students will be required to do extensive reading of current literature and to present oral and written reports.

645. PLANT VIROLOGY (S and U exclusive)

Professors Ross and Rochow.

646. PLANT NEMATOLOGY (S and U exclusive)

Professor Mai and Associate Professor Harrison.

647. BACTERIAL PLANT PATHOGENS (S and U exclusive)

Associate Professor Dickey.

648. PHYSIOLOGY OF PLANT DISEASES (S and U exclusive)

Associate Professor Bateman and Associate Professor Millar.

649. MYCOLOGY (S and U exclusive)

Professor Korf.

650. DISEASES OF VEGETABLE CROPS (S and U exclusive)

Professor Sherf and Associate Professors Lorbeer and Wilkinson.

653. PATHOLOGY OF TREES AND SHRUBS (S and U exclusive)

Associate Professor Sinclair.

654. DISEASES OF FLORIST CROPS (S and U exclusive)

Professor Dimock.

655. PLANT DISEASES IN TROPICAL AGRICULTURAL DEVELOPMENT (S and U exclusive)

Professor Thurston.

661. SEMINAR (S and U exclusive)

Fall and spring terms. Credit one hour. Required of all majors in the department. T 4:30–5:30. Plant Science Seminar Room. Professor Mai.

671. PLANT PATHOLOGY COLLOQUIUM (S and U exclusive)

Fall and spring terms. Credit one hour. First and third Thursdays 8–10 P.M. Plant Science Seminar Room. Staff and graduate students.

VIROLOGY (BIOLOGICAL SCIENCES 498)

POMOLOGY

Students who desire to do their major work in pomology may obtain a suggested sequence of courses for the four-year period by consulting the department.

GENERAL HORTICULTURE (See Vegetable Crops 103)

Those who want a general course in horticulture covering flowers, fruits, and vegetables should take this course.

101. TREE FRUITS

Fall term. Credit three hours. Should be preceded or accompanied by an introductory course in biological science. Lectures, T Th 8. Warren 131. Laboratory, W 2–4:25. Plant Science 107. Professor Edgerton.

A study of the general principles and practices of tree-fruit culture and their relation to the underlying sciences. Topics to be covered include propagation, varieties, orchard management, and growth and fruiting habits. Practical work is presented in grafting, pruning, site and soil selection, and planting.

102. SMALL FRUITS

Fall term. Credit three hours. Should be preceded or accompanied by an introductory course in biological science. Lectures, M W 8. Plant Science 143. Laboratory, M 2–4:25. Plant Science 114. Associate Professor Tomkins.

A study of the general principles and practices in the culture of grapes, strawberries, brambles and bush fruits; and their relation to the underlying sciences. Fruiting and growth habits are covered, with practical work in pruning, planting, and propagation. One or two Saturday field trips will be taken.

201. POST-HARVEST PHYSIOLOGY, HANDLING, AND STORAGE OF FRUITS

Fall term. Credit three hours. Prerequisite, Course 101 or 102. Lectures, T Th 8. Plant Science 134B. Laboratory, F 2–4:25. Plant Science 114. Professor Smock.

The chemistry and physiology of fruits as they affect quality and marketability are studied. Handling methods, maturity indices, and storage practices are considered. Practical work involves grading and inspection of fruits and storage of fruit in different ways. One Saturday field trip is required.

202. ADVANCED LABORATORY COURSE

Spring term. Credit two hours. Th 1:25–4:25. Plant Science 114. Professors Hoffman and Edgerton.

Designed to give more extended practice in the various orchard operations than can be given in Course 101. Special attention is given to problems of pruning, grafting, orchard soil selection and management, pollination, and spray practice. One or two field trips are made.

301. ECONOMIC FRUITS OF THE WORLD

Spring term. Credit three hours. Given in alternate years. Prerequisite, an introductory course in biological science, or permission to register. Lectures, M W 8. Plant Science 143. Laboratory, F 2–4:25. Plant Science 114. Professor Smock.

The more important subtropical and tropical fruit species such as citrus, banana, mango, coffee, and cacao are dealt with. Morphology, physiology, and adaptation to climate are stressed rather than details of culture. A broad view of world pomology is given.

[401. ADVANCED POMOLOGY

Fall term. Credit three hours. Given in alternate years. Prerequisites, Courses 101 and 102 and Biological Sciences 240. Lectures, M W F 8. Plant Science 114. Professor Hoffman.] Not given in 1969–70.

A comprehensive study of the sources of knowledge and opinions as to practices in pomology. The results of experiences and research pertaining to pomology are discussed, with special reference to their application in the solution of problems in commercial fruit growing.

[501. SPECIAL TOPICS IN EXPERIMENTAL POMOLOGY

Spring term. Credit three hours. Given in alternate years. Hours to be arranged. Professors Edgerton and Smock, Associate Professors Oberly and Powell, and Assistant Professor Creasy.] Not given in 1969–70.

The student is expected to review critically and to evaluate the more important original papers relating to the various phases of pomological research. Recent experimental methods applicable to the topic are fully considered.

502. RESEARCH (S and U optional)

Fall, spring, or both terms. Credit two or more hours a term. Prerequisite, Course 401. Undergraduates must attach to their preregistration material written permission from the staff member who will supervise the work and assign the grade. Professors Hoffman, Smock, and Edgerton, Associate Professors Blanpied, Oberly, Powell, and Tomkins, and Assistant Professor Creasy.

600. SEMINAR

Fall and spring terms. Without credit. Required of students taking Course 502 and graduate students in pomology. T 11:15. Plant Science Seminar Room. Members of the departmental staff.

POULTRY SCIENCE

The poultry industry offers opportunities in all phases of production, distribution, technical service, research, and teaching. Individual preference and aptitudes should be considered in making a choice. Suggested sequences of courses are available to students interested in production or in a business allied to it, and to those interested in a career in research, teaching, or commercial work

in such specialized biological science fields as genetics, nutrition, physiology, or food technology. Adequate high school preparation in mathematics, science, and English is very desirable, particularly for students interested in the latter fields.

100. INTRODUCTION TO POULTRY SCIENCE

Spring term. Credit three hours. Lectures, T Th 11:15. Rice 101. Laboratory, W 2–4:25 or 2–2:55. Rice 101. Alternate Wednesday sessions will be used as lecture periods instead of laboratories. On the several days when there are field trips a longer laboratory will be necessary. Professor Bruckner, assisted by other members of the staff.

A general course dealing with the principles of poultry science. Designed to acquaint the student with the biological and economic scope of the poultry industry as well as the problems of production.

270. POULTRY HYGIENE AND DISEASE

Fall term. Credit two hours. Given in alternate years. Prerequisite, Biological Sciences 290 or 290A, and permission of the instructor. Th 2–4:25. Veterinary College. Dr. Hitchner.

The nature of the infectious and parasitic diseases of poultry and the principles of hygiene applicable to poultry farming for the prevention and control of diseases.

280. POULTRY FARM MANAGEMENT

Spring term. Credit three hours. Lectures, T Th 10:10. Rice 101. Laboratory, W 2–4:25. Rice 201. Associate Professor Thacker.

Practical and business management problems of the commercial poultry farm and industry will be studied. Assigned farm studies. Field trips will be taken.

390. POULTRY PROBLEMS (S and U exclusive)

Fall or spring term. Credit, one, two, or three hours. Undergraduates must attach to their preregistration material, written permission from the staff member who will supervise the work and assign the grade. Professor Young.

Investigation of some problem in the field of poultry science by the student under the direction of a member of the staff.

POULTRY NUTRITION (ANIMAL SCIENCE 410)

415. POULTRY NUTRITION

Spring term. Credit one hour. Prerequisite, Animal Science 410 or permission of the instructor. Associate Professor Nesheim.

Intended to provide a discussion of applications of principles of nutrition to feeding poultry. Feed formulations will be stressed with emphasis on linear programming and computer formulation.

[420. POULTRY GENETICS

Spring term. Credit three hours. Given in alternate years. Open also to juniors. Prerequisites, a course in genetics, and permission of the instructor. Lectures, M W F 9:05. Rice 201. Professor Cole.] Not given in 1969–70.

A survey of inherited characters in domestic birds, cytology, linkage, inbreeding, and hybrid vigor; role of heredity in embryonic mortality, resistance to disease, infertility, endocrinology, and reproduction; and genetic principles as applied to poultry breeding.

425. COMPARATIVE PHYSIOLOGY OF REPRODUCTION OF VERTEBRATES

Spring term. Credit four hours. Prerequisites, Animal Science 427 and consent of the instructor. Lectures, M W 10:10. Laboratory to be arranged. Rice 300. Associate Professor van Tienhoven.

Sex and its manifestations, endocrinology of reproduction, interactions between endocrine and nervous systems. The laboratory will provide an opportunity for students to design and execute experiments, with limited objectives, independently.

430. CYTOCHEMISTRY AND CYTOPHOTOMETRY

Spring term. Credit three hours. Prerequisites, Biological Sciences 347 or the equivalent and consent of the instructor. Lectures, T Th 1:25. Rice 101. Laboratory to be arranged. Assistant Professor Bloom.

An advanced course dealing with methods for studying qualitative and quantitative aspects of nucleic acid and protein chemistry of individual cells. Special attention is given to methods of quantitative cytophotometry. Student participation involves presenting "lecture-seminars" and conducting experiments oriented to solving specific biological problems.

440. ANATOMY OF THE FOWL

Fall term. Credit three hours. Given in alternate years. Open to juniors. Prerequisites, Biological Sciences 102 or 104 and permission of the instructor. Lectures, T Th 8. Rice 201. Laboratory, F 2–4:25. Rice 101. Professor Cole.

The lectures, supplemented by laboratory periods for study and dissection, are designed to acquaint the student with the anatomy of the fowl.

[450. POULTRY MEAT AND EGG TECHNOLOGY

Spring term. Credit three hours. Given in alternate years. Prerequisite, Chemistry 355, or its equivalent, and Biological Sciences 290. Lectures, T Th 9:05. Laboratory to be arranged. Rice 101. Professor Baker.] Not given in 1969–70.

A discussion and study of some of the important microbial and nonmicrobial changes in poultry meat and eggs as well as the chemical composition and preservation of these products. Development of new products is also emphasized.

MEAT AND MEAT PRODUCTS (ANIMAL SCIENCE 290)

511. SPECIAL TOPICS IN NUTRITION

Fall or spring term. Credit and hours to be arranged. For graduate students only. Registration by permission of staff members concerned. Professors R. J. Young and M. L. Scott, Associate Professor Nesheim.

For students desiring experience in planning, conducting, and reporting independent research projects in poultry nutrition.

609. SEMINAR IN POULTRY BIOLOGY (S and U exclusive)

Fall and spring terms. For graduate students. Th 4:15. Rice 300. Members of the department staff.

A survey of recent literature and research in poultry biology.

619. SEMINAR ON ANIMAL NUTRITION

Fall term. Credit one hour. Open to graduate students with major field of study in animal nutrition. Registration by permission. M 4:30. Morrison 348.

A critical review of the literature and other topics of special interest to graduate students in animal nutrition.

ADVANCED NUTRITION
(See description under Animal Science.)

PROTEIN AND AMINO ACIDS (FOOD AND NUTRITION 501)
(See the *Announcement of the College of Home Economics.*)

502. LIPIDS AND CARBOHYDRATES
Fall term. Credit two hours. T Th 11:15. Rice 300. Associate Professor Bensadoun.

NUTRITIONAL ENERGETICS (ANIMAL SCIENCE 503)

504. MINERALS AND VITAMINS
Spring term. Credit two hours. T Th 11:15. Rice 201. Professor M. L. Scott.

RURAL SOCIOLOGY

Students who specialize in rural sociology may choose a sequence of courses designed (1) to provide a broad general understanding of rural societies, methods of analyzing societal systems, how they are organized, the interaction of individuals, groups, organizations, and institutions undergoing modernization and change; (2) to offer training in strategies of domestic and international development; (3) to prepare for professional careers in research, teaching, and applied sociology. Graduate study is essential for those wishing to become professional sociologists.

100. GENERAL SOCIOLOGY
Fall or spring term. Credit three hours. May not be taken by those who have credit for Sociology 101. Lectures, T Th 10:10. Warren 45. Discussion sections: Fall, 9:05–2:15. Warren 232; spring, 9:05–2:15, Warren 201. Fall term, Assistant Professor Eberts. Spring term, Assistant Professor Stockdale.

A general introduction to the theory and methods of sociology. Major topics selected for discussion include culture, socialization, deviancy and social control, stratification, ideologies, and social change. Supplementary reading including recent research will be assigned for illustrative purposes and to assist students in analyzing topical areas as term projects.

200. ANALYSIS OF SELECTED SOCIETAL FIELD PROBLEMS
Spring term. Credit three hours. Prerequisite, Course 100. T Th 10:10. Warren 345. Discussion sections to be arranged. Assistant Professor Eberts and Assistant Professor Stockdale.

Designed to follow Course 100 through a close student-teacher working relationship. The course will enable students to explore in greater depth selected societal issues and problems. The four main areas with which the course will be concerned are: (1) growth and stagnation; (2) power, class, stratification, and poverty; (3) race relations; (4) social protest. These topics will be analyzed and compared at three levels of analysis: community, national, and international.

[210. FOUNDATIONS FOR DECISION MAKING AND SOCIAL ACTION (S and U optional)
Fall term. Credit three hours. Not open to freshmen. M W F 10:10. Warren 145. Professor Reeder.] Not given in 1969–70.

The purpose is to provide the basic information essential to an understanding of decision making, social action, and planned change. The course is designed for two categories of students: (1) students of various fields who wish to take one or two courses in sociology and who want to gain the kind of knowledge which relates directly to human relationships in their occupation and in their activities as organization members and citizens; (2) persons whose work or interests are likely to involve them in some phase of planned change—either as administrators, organization leaders, extension agents, teachers, or community development workers—and others for whom the role of change agent is an essential part of their job.

220. INTRODUCTORY RESEARCH METHODS (S and U optional)

Spring term. Credit three hours. M W F 11:15. Warren 160. Staff.

Intended to initiate an interest in the strategies of both discovery and proof in social research, the course will be divided into four areas. Part one will deal with the strategy of theory construction, concept formation, and the establishment of logical validity in both the deterministic and probabilistic. Part two will discuss the strategies of empirical inquiry. This will entail introductory discussions of hypotheses formation, probability, and experimental design, together with a presentation of guides to the selection criteria for the use of field versus laboratory techniques. Part three will consist of discussions of the techniques of analysis, problems of inference, statistical application, and the legitimacy of evidence. It is intended that students gain some introductory familiarity with computer analysis and machine use. The course will conclude with the discussion of the contribution of introductory mathematics and logical investigation to the social sciences. The techniques used in other fields such as anthropology, economics, history, and journalism will receive attention.

300. RURAL SOCIOLOGY (S and U optional)

Fall term. Credit three hours. Not open to freshmen or sophomores. M W F 11:15. Warren 145. Assistant Professor Stockdale.

Designed to provide an introduction to rural sociology for students with little or no background in sociology. Structure, processes, and change in agriculture and in rural systems are examined and a sociological perspective is introduced.

Theory, methods, and findings in sociology will be presented mainly by relating them to such contemporary problems and topics as agricultural adjustment and policy, rural poverty, rural to urban migration, social movements, changes in organizations and agencies, community structure and change, and ties of rural systems to mass society. Social stratification and power will be emphasized throughout the course.

334. RURAL SOCIAL PROBLEMS AND PUBLIC POLICY

Spring term. Credit three hours. Given in alternate years. Not open to freshmen or sophomores. M W F 9:05. Warren 31. Professor Larson.

Social problems in American rural life and an analysis of the policy-making process. Primary emphasis is on the sociological aspects of current public problems in the United States such as low-income farmers, migratory agricultural labor, and institutionalized social services. Each problem selected is analyzed in terms of historical background, public policy, national programs, and the consequences of the policy and program. Comparisons are made with other countries.

[405. ORGANIZATION DYNAMICS (S and U optional)

Spring term. Credit three hours. Prerequisite, Course 100 or 210 or permission

of the instructor. Not open to freshmen or sophomores. T Th 10:10–12:05. Warren 31. Professor Reeder.] Not given in 1969–70.

A study of the organization theory, and the methods and techniques by which organization consultants, officers, group members, and administrators may increase the effectiveness of organizations. Five categories of organization problems are considered: (1) program problems, (2) leadership problems, (3) membership problems, (4) problems related to meetings, and (5) organizational and public relations problems. Primary emphasis is given to organizations and service agencies which are found in rural society. The first hour is a lecture-discussion period; the second hour is a group skills, group process, and group sensitivity laboratory.

411. COMMUNITY AND REGIONAL DEVELOPMENT AND PLANNED CHANGE (S and U optional)

Spring term. Credit three hours. T Th 11:15–12:30. Warren 232. Professor Capener and others.

Various strategies of development and planned change will be explored. Reviewed also will be programs, organizations, agencies, and institutions operating in communities and regions that address themselves to various development strategies. Two major emphases are stressed: (1) the structural-functional roles and processes of organizations, agencies, and institutions as they implement programs of change and development in communities and regions, (2) roles of professionals and change agents representing and operationalizing development units.

412. RURAL SOCIETY (S and U optional)

Fall term. Credit three hours. Prerequisite, Course 100 or equivalent. Not open to freshmen or sophomores. M W F 9:05. Warren 31. Professor Larson.

Intended as a basic course in the sociology of rural life, using the social system concept as a theoretical framework. Rural society in the United States is used as a case to illustrate the structure and function of major rural social systems in modernized societies. Comparisons are made with western European countries. The changing relationship with urban and societal systems is discussed. Some consideration is given to the implications of social structure and function for action programs serving rural people.

420. COMPARATIVE RURAL SOCIETIES (S and U optional)

Fall term. Credit three hours. Prerequisite, a course in general sociology or anthropology. M W F 11:15. Warren 231. Associate Professor Young.

The development of nations, regions, and communities is analyzed from a macrostructural perspective, emphasizing the pervasive nature of social communication and symbolic transformations. Results of recent and on-going comparative studies are reported, and previous theoretical work relevant to structural change—Marx, Durkheim, Parsons, etc.—is reviewed.

421. COMMUNITY STRUCTURE AND CHANGE

Fall term. Credit three hours. Open to seniors and graduate students, others by permission. W F 1:25–2:40. Warren 232. Associate Professor Erickson.

An overview of various models in approaching communities as objects of study. Analysis will focus on the methodologies by which power structures are examined, the relation of local community units to extracommunity systems, the forms of community cohesion and autonomy, the relation of local power structures to decision making, and the relation of changes in division of labor, urbanization, suburbanization, and values to patterns of community life.

424. OCCUPATIONAL STRUCTURE IN INDUSTRIAL AND DEVELOPING COUNTRIES (S and U optional)

Fall term. Credit three hours. Prerequisite, Course 100 or equivalent. T Th 2:30–3:45. Warren 232. Professor Taietz.

Cross-national comparisons of occupational differentiation and related issues. Particular attention will be given to the relation of the occupational structure to social stratification, mobility within the structure, and occupational prestige ranking.

432. COMMUNITY LEADERSHIP (S and U optional)

Spring term. Credit three hours. Open to seniors and graduate students. Lecture, T 9:05. Seminar, W 1:25–3:55. Warren 232. Professor Cummings.

A study of leadership theories and decision-making strategies as applied to community and regional development. The nature of leadership requirements in a political democracy are examined along with implications for leadership education in public affairs.

437. THE SOCIOLOGY OF AGING (S and U optional)

Spring term. Credit three hours. Prerequisite, Course 100 or equivalent. T Th 2:30–3:45. Warren 232. Professor Taietz.

The theory and research in this growing field will be examined. Programs for the aged in the United States and Western Europe will be evaluated, and the assumptions underlying these programs will be analyzed.

443. POLITICS, SOCIAL CONTROL, AND PLURALISM (S and U optional)

Fall term. Credit three hours. Open to upperclassmen and graduate students. Prerequisite, Course 100 or equivalent. T Th 11:15–12:30. Warren 232. Assistant Professor Eberts.

Comparative analyses of substantive and methodological issues in social control processes within the political economies of primarily Western democracies, but with illustrative attention to Communist and developing societies. Pluralism and control will be viewed relative to productive, allocative, and staffing processes of society, as they affect various occupational categories, communities of different size, and institutions primarily responsible for maintaining social order.

500. EVALUATION RESEARCH

Spring term. Credit two hours. Registration by permission only. F 3:35–5:30. Warren 232. Staff.

Evaluation as measurement of induced change resulting from action programs and extension education. Public concern with evaluation. Organizing for evaluation. Kinds and levels of evaluation. Utilizing the findings of evaluation studies and research. The by-products of evaluation. Principal emphasis on methodology and techniques, including review of significant evaluation studies and research. Course includes laboratory and field work.

[510. SEMINAR ON DECISION MAKING AND SOCIAL ACTION

Fall term. M F 10:10 and a weekly two-hour laboratory. Time to be arranged. Warren 31. Professor Reeder.] Not given in 1969–70.

An introduction to research and theory on decision making and social action at the graduate level. The lectures for Course 210 are used to provide a systematic presentation of the subject and the two-hour weekly laboratory is used to discuss additional research and theory related to the topics presented.

511. THE METROPOLITAN COMMUNITY

Fall term. Credit three hours. Graduate student status or consent of an instructor. F 1:25–4:00. Warren 231. Assistant Professor Eberts.

An interdisciplinary course focused upon social, political, and economic aspects of metropolitan America. Viewed from the perspective of demography, ecology, social organization, and planning, the emergence of a new society form and its implications for contemporary America will be considered.

(This course is also given as Sociology 501 with Assistant Professor Marden and as Planning 714 with Associate Professor Feldt. Students registering for this course must do so under their respective college course number.)

515. RESEARCH DESIGN

Fall term. Credit three hours. Open to graduate students only. T Th 1:25–2:55. Warren 131.

An introduction to the methods of social research. Course topics follow the major steps in the design and execution of sociological research from the definition of the problem and formulation of hypotheses to the interpretation of results and preparation of a final report. Practice exercises are assigned each week utilizing data from departmental projects.

516. CROSS-CULTURAL RESEARCH METHODS

Spring term. Credit three hours. Prerequisite, Course 515 or permission of the instructor. W F 1:25–2:40. Warren 131. Associate Professor Young.

The comparative study of large social systems is presented as a new research style that is especially appropriate to research in and on developing countries. The field technique of macrosurveys is considered in detail, but the uses of available data such as national social accounting, documents, ethnographic reports, and aerial photographs are emphasized. Special attention is given to trend studies, the assumptions of macrostructural analysis, rapid, low-cost research procedures, and the mechanics of data archives.

522. SOCIAL POWER AND COMMUNITY DECISION MAKING

Spring term. Credit three hours. M W 9:05–10:20. Warren 101. Assistant Professor Stockdale.

A sociological approach to power as an aspect of community life. The importance of social power in community decision making and action programs is considered. The influence of community power structures in instigating and retarding change is analyzed. Recent community power studies are reviewed. The methodology and the theoretical approaches of these studies are analyzed.

528. APPLICATIONS OF SOCIOLOGY TO DEVELOPMENT PROGRAMS

Spring term. Credit four hours. Open to graduate students only. M W F 11:15–12:30. Warren 31. Professor Polson.

Application of sociological theory and methods to the problems of institutions and agencies concerned with rural development. Special emphasis is placed on programs for agricultural extension education and community development in low-income countries.

540. INTRODUCTION TO COMPUTER USE (S and U optional)

Fall and spring terms. Credit two hours. Prerequisite, one course in statistics. T Th 11:15. Plant Science 141. Assistant Professor Eberts.

The purpose is to introduce the student who wishes to use the computer in his research but who does not necessarily want to become a programmer to the system at Cornell.

The course is divided into two parts. The first part is designed to give the student a working knowledge of the elementary aspects of Fortran IV so that he will be able to do preliminary transformations of his data and simple Fortran programs.

The second part deals with the various "canned" programs which are most often used by social scientists. The student is introduced to program packages such as Michigan, Bimed, and SSP. Examples will be given on how to run the programs as well as discussions on the differences between them.

[613. SEMINAR: RURAL SOCIOLOGY

Spring term in alternate years. Credit three hours. Prerequisite, Course 412. Hours to be arranged. Professor Larson.] Not given in 1969–70.

A review of the development of rural sociology as a social science discipline. A review of research literature in selected major subfields of rural sociology. Emphasis is on sociological generalizations and on the integration of theory and research.

622. COMMUNICATION AND SOCIAL SYMBOLICS

Spring term. Credit three hours. Open to graduate students. Registration by permission. Hours to be arranged. Associate Professor Young.

A seminar on the theoretical and methodological problems of interpreting social phenomena as structures of symbolics by which information is processed. Topics include a review of theoretical literature, a consideration of basic empirical forms such as communication networks, differentiated institutional patterns and reactive structures, and related techniques of macrostructural research.

624. SEMINAR IN SOCIETAL STRESSES (S and U optional)

Spring term. Credit three hours. M W 10:10. Warren 232. Assistant Professor Eberts.

Analysis of major theoretical and research problems related to conceptualizing stress areas in society's changing organizational processes. Topics will be covered by reports on major classical and contemporary theorists, paying particular attention to their research potentiality, using modern analytic techniques on current issues in political economy.

630. SEMINAR IN CONTEMPORARY THEORIES OF PLANNED SOCIAL CHANGE

Fall term. Credit three hours. Open to graduate students and seniors with consent of the instructor. T Th 11:15–12:45. Warren 145. Staff.

This seminar is organized around contemporary theories of: (1) cultural change, (2) societal and institutional change, (3) community and regional change, (4) organization change, (5) social action situational change, and (6) individual and personality change. The interrelationships of these different types and levels of change to each other is considered. Major emphasis is placed on theories that can be applied in planned social change and on their applications in modernization and development programs.

635. THE SOCIOLOGY OF AGRARIAN MODERNIZATION AND DEVELOPMENT

Fall term. Credit three hours. Open to graduate students. T Th 10:10. Warren 231. Staff.

Concerned with the macrosociological factors affecting agrarian modernization and development. The main focus will be on the impact of change and growth on the organization and integration of the rural and urban sectors.

In addition, the nature and change of national agrarian policies will be examined.

636. SEMINAR IN SOCIAL CHANGE AND DEVELOPMENT

Spring term. Credit three hours. W 1:25–3:20. Warren 160. Associate Professor Erickson.

Review of selected theories of social change; an analysis of recent social and cultural changes occurring in new nations and developing economies; problems of traditional social structures undergoing modernization; and the social factors in economic growth, changes in caste and class, nation building, education, family, and religion.

642. FIELD PROBLEM IN PLANNING: URBAN/RURAL POVERTY

Spring term. Credit four hours. Open to graduate students only. Prerequisite, any two of the following courses or consent of the instructors: Courses 443, 421, Agricultural Economics 650, Planning 721, 760, 780. M W 4:40–6:30. Sibley 115. Assistant Professors Clavel and Eberts.

Intended to give the student field practice in the design of policies and programs for the alleviation of poverty at the local, county, and multicounty levels. Community practices in dealing with poverty will be examined and studied in the framework of economic and social measurement and analysis.

Members of the class will participate in seminars and field work. Visiting lecturers will be invited, including professionals from the communities studied.

(This course is also given as Planning 742 with Assistant Professor Goldsmith. Students registering for this course must do so under their respective college course number.)

651. SEMINAR IN OCCUPATIONAL STRUCTURE

Spring term. Credit three hours. T Th 9:05–10:20. Warren 260. Professor Bauder.

A survey of theory and research concerned with the organization of work roles in industrial societies. Special attention will be given to (1) variations in the content and organization of work roles at different levels of the occupational structure and in different segments of the economy, and (2) changes in the meaning of work associated with such factors as automation, professionalization, bureaucratization, increased leisure time, and increased participation of women in the labor force.

652. SEMINAR IN MANPOWER AND WORK ORGANIZATION

Fall term. Credit three hours. Prerequisites, nine hours in sociology or equivalent or permission of the instructor or the head of the Department of Rural Sociology. Hours to be arranged. Professor Taylor.

The thesis of this seminar will deal with occupations in urbanized social organization. Among the selected subjects for seminar reports and discussions will be: Multiplicity of Occupations: Manpower and Mobility; Environments of Work—Bureaucracy, Professionalization, and Unionization; Status and Prestige; Occupational Aspiration; Occupational Preparation; Entry into the Labor Force; Career Patterns; Rewards and Remuneration; Work Controls and Associations; Retirement from Occupations; Colleagueship; and Work and Occupational Ideologies.

Departmental Seminar, Research and Special Study

350. UNDERGRADUATE RESEARCH

Fall and spring terms. Credit one to three hours, by arrangement, depending upon the problem undertaken. Undergraduates must attach to their preregistration material written permission from the staff member who will supervise the work and assign the grade.

550. INFORMAL STUDY IN RURAL SOCIOLOGY

Throughout the year. Credit to be arranged. Prerequisites, graduate standing and permission of the department staff member concerned. Members of the staff.

551. RESEARCH IN RURAL SOCIOLOGY

Throughout the year. Credit to be arranged. Prerequisites, graduate standing and permission of the staff member concerned. Members of the staff.

699. SEMINAR

Fall and spring term. No credit. For graduate students majoring in rural sociology. Second and fourth Monday of each month, 3:35–5:05. Warren 32. Departmental staff.

STATISTICS AND BIOMETRY

Four-year students interested in specializing in biometry may obtain suggested sequences of courses by consulting members of the Biometrics Unit, Department of Plant Breeding and Biometry. This biometry program provides both training for numerous positions which are available at the Bachelor's degree level and preparation for graduate study in statistics and biometry. It is recommended that the student be competent in mathematics and at least one other area of specialization in the College. For courses in statistical genetics and special topics, see courses listed under Plant Breeding. For an additional course involving biomathematics see Elements of Physical Biology 920 in the *Announcement of the Veterinary College*.

200. DATA COLLECTION AND INTERPRETATION

Spring term. Credit three hours. M W F 8. Warren 245. Prelims to be given on Thursday evening, 7:30 to 9:00, of the fourth, eighth, and twelfth weeks of the term. Professor to be appointed.

An introduction to the basic concepts and definitions in measurement, the principles of scientific experimentation, and graphical presentations. An historical résumé of experimentation will be presented, together with methods for obtaining data related to a phenomenon of interest. Elementary definitions and concepts of sample survey and experimental designs will be presented; considerable emphasis will be placed on obtaining meaningful data and upon designing information into data. Elementary methods of summarizing meaningful facts from the data will involve the arithmetic mean, median, mode, variance, range, and ranks. In this connection considerable use will be made of the material in D. Huff's book, *How to Lie with Statistics,* I. D. Bross's book, *Design for Decision,* M. J. Monroney's book, *Facts from Figures,* and E. B. Wilson's book, *Introduction to Scientific Method.* Material on U.S. Govern-

ment statistics relative to types and methods of procuring data will be included as time permits. Elementary *concepts* of populations, sampling from populations, model building, probability, frequency distributions, and interval estimation of population parameters will be presented. Emphasis will be on ideas, concepts, and understanding rather than on methods. The material in this course is complementary to the material presented in Industrial and Labor Relations 210, and nonrepetitive.

407. COMPUTER TECHNIQUES FOR STATISTICS AND BIOLOGY

Fall term. Credit two hours. Prerequisite or corequisite, an introductory course in statistics. Lecture, M 11:15. Bradfield 101. Laboratory, M 2. Warren 160. Associate Professor Searle.

Introduction to uses of computers in statistics: calculation of elementary statistical analyses, techniques of sampling and simulation, and availability of library programs. CUPL, the Cornell University Programming Language, will be taught and used for problem solving; use may also be made of some library programs.

408. STATISTICAL ANALYSIS I

Fall term. Credit three hours. Prerequisite, Mathematics 112 or consent of instructor. Lectures, M W F 10:10. Warren 345. Assistant Professor Solomon.

Statistical theory is developed for the analysis of discrete data. The concepts of statistical inference are introduced with emphasis on discrete distributions and their applications in biology. Concepts and techniques from probability theory including conditional probability, moments, probability generating functions, and Markov Chains are introduced as needed.

409. STATISTICAL ANALYSIS II

Spring term. Credit three hours. Prerequisite, Course 408. Lectures, M W F 10:10. Warren 345. Assistant Professor Solomon.

The concepts developed in Course 408 are extended to the analysis of data from continuous distributions. Emphasis on biological applications is maintained.

[411. STOCHASTIC MODELS IN BIOLOGY

Spring term. Credit three hours. Given in alternate years. Prerequisite, Course 409. Lectures, M W F 10:10. Warren 345. Discussion period to be arranged. Professor to be appointed.] Not given in 1969–70.

An introduction to stochastic processes in biology. The necessary mathematics and statistics will be introduced as needed. Recurrent events, random walk models, Markovian processes, birth-and-death processes, epidemic processes, competition and predation, diffusion processes, and other models currently used in biological theory will be discussed and applied. Special emphasis will be given the various processes applied to genetics.

[412. DETERMINISTIC MODELS IN BIOLOGY

Spring term. Credit three hours. Given in alternate years. Prerequisite, Course 409. Lectures, M W F 10:10. Warren 345. Discussion period to be arranged. Professor to be appointed.] Not given in 1969–70.

An introduction to deterministic mathematical models in biology. The application will be from the biological viewpoint. The necessary mathematics will be introduced as needed. Finite differences, differential equations, logistic, growth and decay, and other deterministic models corresponding to those introduced in 411 will be discussed.

417. MATRIX ALGEBRA IN BIOLOGY AND STATISTICS

Fall term. Credit three hours. Prerequisite, the equivalent of one year of college algebra. Lectures, M W F 9:05. Warren 201. Associate Professor Searle.

Elements of matrix algebra with applications in biology and statistics. Arithmetic procedures and other matrix operations; rank and linear independence, latent roots and vectors, solving linear equations, generalized inverses, direct sums and products. Use of matrices in regression analysis and linear statistical models.

510. STATISTICAL METHODS I

Fall term. Credit four hours. Prerequisite, graduate standing or permission of instructor. T Th S 10:10. Plant Science 233. Laboratory to be arranged. Examinations will be held at 7:30 P.M. on Thursday evenings. Assistant Professor Urquhart.

The distributions of statistics encountered in biological and other fields are considered from the point of view of elementary probability notions and by sampling from known populations. The results, with principles of experimentation, are applied to the conduct of experiments and interpretation of results. Topics include point and interval estimation, tests of hypotheses and of significance, the treatment of discrete data, methods involving rank sum procedures, the consideration of normal populations, the one-way analysis of variance and simple linear regression. Emphasis is placed on basic statistical principles, criteria for selection of statistical techniques and the application of these techniques to a wide variety of biological situations.

511. STATISTICAL METHODS II

Spring term. Credit four hours. Prerequisite, Course 510 or the equivalent. T Th S 10:10. Warren 231. Laboratory to be arranged. Examinations will be held at 7:30 P.M. on Thursday evenings. Assistant Professor Urquhart.

The work of Course 510 is continued. Topics include multiple and curvilinear regression, complex analyses of variance and covariance. The analysis of variance discussion considers treatment designs, single degree of freedom contrasts, the simpler experimental designs, sampling errors, fixed, mixed and random models, and the effect of disproportionate numbers. When appropriate, the computer is considered as the reasonable way to have calculations done.

[513. DESIGN OF EXPERIMENTS I

Fall term. Credit four hours. Prerequisites, Courses 409 and 511, or the equivalent. M W F 8. Warren 31. Discussion period to be arranged. Professor Federer.] Not given in 1969–70.

Principles and techniques of experimentation, theoretical concepts, extensions and variations of the completely randomized, randomized complete block, and latin square designs, the factorial experiment and confounding, fractional replication including response surface designs, lattice designs, crossover designs, augmented and other designs, covariance analyses, error rates, tests and interval estimation for ranked means, sample size, variance component analyses, unequal number analyses, the place of orthogonality in design, and advanced statistical methodology under various fixed, mixed, and random models.

[514. DESIGN OF EXPERIMENTS II

Spring term. Credit four hours. Prerequisite, Course 513. M W F 8. Warren 31. Discussion period to be arranged. Professor Federer.] Not given in 1969–70.

A continuation of the work in Course 513 with emphasis on the role of confounding in experimental and treatment designs. Generalized forms of

analyses and construction are presented followed by a discussion from selected topics on long-term experiments, combination of results from several experiments, sequential experimentation, variance component analyses, estimation procedures, linear hypotheses, heritability studies, multivariate analyses, unequal numbers analyses, and related topics.

517. LINEAR MODELS (S and U)

Spring term. Credit three hours. Prerequisites, Courses 417, 511 and Mathematics 370 or 371. T Th 12:20. Warren 201. Associate Professor Searle.

Introduction to multinormal variables and distribution of quadratic forms; linear statistical models, estimable functions and testable hypotheses; regression models, experimental design models, variance components models, and combinations thereof.

[518. SPECIAL TOPICS IN SEQUENTIAL SAMPLING, BIOASSAY, NONPARAMETRIC STATISTICS, ETC.

Spring term. Credit three hours. Prerequisite, Course 511 or the equivalent. Time and place of lecture to be arranged. Professor Robson.] Not given in 1969–70.

Topics include the principles and methodology of bioassay, discriminant functions, sequential analysis, nonparametric methods, mark-recapture methods, and path analysis.

519. STATISTICAL GENETICS

Spring term. Credit three hours. Prerequisite, Course 513 and Mathematics 371. Time and place of lectures to be arranged. Professor Robson.

An introduction and application of the theory of Markov chains to mating systems including selfing, sibbing, backcrossing, and random mating, with a discussion of genetic variance component analysis.

499. SPECIAL PROBLEM IN STATISTICS AND BIOMETRY

Fall, spring, or summer. Credit one or more hours by arrangement with instructor. Prerequisite, permission to register. Biometrics Unit staff.

VEGETABLE CROPS

Students planning to specialize to a greater or less extent in vegetable crops should consult the department regarding choice and sequence of courses. An outline of suggestions is available.

103. GENERAL HORTICULTURE

Spring term. Credit four hours. Lectures, M W F 8. East Roberts 222. Laboratory, M W or Th 2–4:25. Guterman 110. Associate Professor Sheldrake.

An introductory course in general horticulture, including flower, fruit, and vegetable growing. Intended primarily for students who want a general knowledge and for those who wish to specialize in some field of horticulture but have limited background, either in practical experience or in training in botany and agronomy.

210. VEGETABLE TYPES AND IDENTIFICATION

Fall term. Credit two hours. T 2–4:25. Guterman 110. Associate Professor Topoleski.

Designed to acquaint the student with the vegetable species grown in the

Northeast and the pests and disorders encountered in their production. Subjects covered including grading and grade defects, nutrient deficiencies, vegetable judging, and seed and seedling identification. This course prepares the student to teach this material to preadult groups or adult leaders in 4-H or vocational agriculture.

211. COMMERCIAL VEGETABLE CROPS

Fall term. Credit four hours. Should be preceded by elementary courses in agronomy, botany, and chemistry. Prerequisite, Course 103 or its equivalent. Lectures, M W F 11:15. East Roberts 222. Laboratory, W or F 2–4:25. Guterman 110. Professor Sweet.

Intended for those interested in the commercial vegetable industry from the viewpoint of production, processing, marketing, or the related service industries. Topics included are techniques, problems and trends in the culture, harvesting, storage, and marketing of the major vegetable crops including potatoes. Several field trips are taken.

212. HANDLING AND MARKETING VEGETABLES

Fall term. Credit three hours. Lectures, T Th 11:15. East Roberts 222. Laboratory, T or W 2–4:25. East Roberts 223. Professor Hartman.

Principles and procedures involved in the distribution, processing, and quality maintenance of vegetables from harvest to the ultimate consumer. Development, validation, and use, present and prospective, of instrumental measurements of color, texture, and flavor in vegetables. Specifications, purposes, and utilization of quality standards by food and health-control governmental agencies, by food manufacturers, and by research organizations.

331. UNDERGRADUATE RESEARCH

Fall and spring terms. Credit one or more hours a term, by arrangement. Undergraduates must attach to their preregistration material, written permission from the staff member who will supervise the work and assign the grade, Any member of the staff.

Special problems may be elected in any line of vegetable work.

401. VEGETABLE CROP PHYSIOLOGY

Fall term. Credit five hours. Prerequisites, Course 211 and Biological Sciences 240 or their equivalent. Lecture, M W F 11:15. Plant Science 143. Laboratory, M 2–4:25. Discussion period to be arranged. Professor Kelly.

The physiological bases of cultural practice and the application of these principles to problems in vegetable production. Original literature is used to illustrate the principles involved. Experimental material is studied in the laboratory to amplify lecture topics. Subjects discussed include: mineral nutrition as influenced by fertilization programs and crop sequence; nutrient interactions and induced deficiencies; growth and development; flowering; fruit setting; growth correlation; senescence; sex expression; photoperiodism; vernalization; and environmental factors affecting growth.

412. HANDLING AND MARKETING VEGETABLES, ADVANCED COURSE

Fall term. Credit four hours. Lectures, T Th 11:15. East Roberts 222. Laboratory, T or W 2–4:25. East Roberts 223. One-hour conference to be arranged. Professor Hartman.

This course has the same lecture, laboratories, and field trips as Course 212. Much more outside reading of research and trade publications in the area covered by the course is required in Course 412 than in Course 212, and different examinations are given for the two courses.

[413. KINDS AND VARIETIES OF VEGETABLES

Fall term. Credit three hours. Given in alternate years. Prerequisite, Course 103 or 211 or permission to register. Professor Minges and staff.] Not given in 1969–70.

Designed to help students achieve proficiency in the evaluation of vegetable varieties through study of their origin, characteristics, adaptation, and usage. An important part of the course is the study of crops in the field. The vegetable seed industry is also discussed.

429. SPECIAL TOPICS IN PLANT SCIENCE EXTENSION

Spring term. Credit one hour. (Additional credit by special arrangement.) Given in alternate years. Lecture, F 8. Plant Science 141. Discussion period, F 2–4. Plant Science 37. Professor Minges.

Designed for graduate students and advanced undergraduates in the several plant science fields who wish to acquire a knowledge of extension activities in preparation for careers in extension and associated work, such as research and technical work in both public and commercial organizations. Topics are related to extension in other countries as well as in the United States. Staff members from other plant science departments collaborate in teaching the course.

[501. RESEARCH METHODS IN VEGETABLE CROPS

Spring term. Credit three hours. Given in alternate years. Prerequisite, Course 401. It is recommended that Plant Breeding 510 and 511 precede or accompany this course. Lectures, M W F 9:05. East Roberts 222. Professor Kelly.] Not given in 1969–70.

A study of research techniques peculiar to vegetable crops.

601. SEMINAR

Fall and spring terms. Required of graduate students taking either a major or minor in this department. Undergraduates are welcome. Th 4:30. East Roberts 222. Members of Departmental staff.

610. SPECIAL TOPICS IN VEGETABLE CROPS

Fall and spring terms. Credit to be arranged. Prerequisite, permission to register. Time to be arranged. East Roberts 222. Assistant Professor Ozbun.

For graduate students with special interest in plant physiology. Weekly discussions of current topics in plant physiology as related to vegetable crops. Students will be required to present oral reports on current literature and to prepare and present a research proposal.

COURSES IN OTHER COLLEGES

Satisfactory completion of certain courses in other colleges at Cornell may meet the specific requirements of regular students in the College of Agriculture.

Reference should be made to the *Announcement of the College of Arts and Sciences,* or to the supplements issued by that College, for descriptions of Freshman Humanities, Chemistry 103 and 104, or 107 and 108, Physics 101 and 102, and Biological Sciences 103–104, which may be used to satisfy the requirements in those subjects, as listed on page 36.

GENERAL INFORMATION

THE BUILDINGS

The buildings and land of Cornell University are valued at more than $100,000,000 and the equipment at well over $40,000,000. On that portion of the campus devoted principally to the College of Agriculture, and frequently referred to as the "upper campus," there are sixteen buildings containing classrooms. Around the "Ag quadrangle" are the following buildings which house the departments indicated:

Comstock Hall, entomology
Caldwell Hall, entomology
Warren Hall, agricultural economics and rural sociology
Stone Hall, education
Roberts Hall, communication arts, division of biological sciences
East Roberts Hall, extension, vegetable crops
Plant Science Building, floriculture and ornamental horticulture, pomology, plant pathology, and vegetable crops

Slightly northwest of the quadrangle is Savage Hall in which are centered some of the activities in nutrition. In succession to the east of the quadrangle are:

Bradfield Hall, agronomy, plant breeding, genetics and development
Emerson Hall, agronomy, plant breeding
Fernow Hall, conservation
Rice Hall, poultry science
Stocking Hall, food science and microbiology
Riley-Robb Hall, agricultural engineering
Morrison Hall, animal science
Wing Hall, biochemistry and molecular biology

As far as possible, classes and laboratory exercises for courses offered in the sixteen departments of the College are conducted in the buildings in which the offices of the departments are located. However, in many instances this is impossible. The student should therefore consult the course descriptions in this *Announcement* in order to determine the exact location of each class or laboratory exercise.

In addition to the foregoing classroom buildings, on the campus of the College are an auditorium (Bailey Hall), a fine modern library (Mann Library), new bioclimatic laboratories, sixteen greenhouses, a judging pavilion, and numerous special laboratories and barns.

Students in the College of Agriculture take many courses in other colleges of the University, particularly in the College of Arts and Sciences. There the most frequently visited buildings are Goldwin Smith Hall for English and the humanities, Baker Laboratory for chemistry, Rockefeller Hall for physics, Sibley Hall for government and history, Stimson Hall for ecology and systematics, and White Hall for mathematics.

Of interest to all students in the University are such buildings as the Uris Library for undergraduate study: Olin Library for graduate research; Gannett Medical Clinic; Willard Straight Hall for social activities; Anabel Taylor Hall for interfaith activities; Barton Hall, Helen

Newman Hall, and Teagle Hall for physical education; Lynah Hall for ice skating; and Sage Chapel for interdenominational church services.

The offices of administration for the College of Agriculture are located in Roberts Hall, and those for the general administration of the entire University are situated in Day Hall. The administrative center of student life in the College of Agriculture is the Office of Resident Instruction located in Roberts Hall. All students, both prospective and already enrolled, are urged to visit this office for guidance on questions pertaining to undergraduate activities.

LANDS FOR RESEARCH AND INSTRUCTION

The New York State College of Agriculture uses about 11,000 acres of land for its research program and for instructional purposes. About 86% of this land is owned by Cornell University, 7% is owned by the State of New York; the balance is leased or owned by other agencies or is on grower farms. Of the land owned by Cornell University, some 6,800 acres are in Tompkins County and about 2,700 acres outside the county. Of the State-owned land 473 acres are in Tompkins County and 280 acres outside the county. The land is used primarily by research workers of the Cornell University Agricultural Experiment Station (Ithaca) and the New York State Agricultural Experiment Station (Geneva), both of which are a part of the New York State College of Agriculture.

The type and amount of land assigned to each department varies according to its needs. Some Departments, such as Agronomy, Plant Breeding and Biometry, Floriculture and Ornamental Horticulture, Pomology, and Vegetable Crops, need tillable land with certain types of soil on which to conduct field experiments. The Animal Science Department needs large areas suitable for pasture and for the production of hay, grain, and corn for silage to feed experimental animals in the dairy and beef cattle herds, sheep, and swine.

Arable land not immediately needed by the individual departments for research and instruction is operated by the Office of Farm Services on an extensive basis. This office also acts as a service department, plowing and fitting some of the land used by other departments for experimental purposes. This system avoids the duplication of expensive machinery and uses the farm labor efficiently. The Departments of Animal Science, Agronomy, Plant Breeding and Biometry, Pomology, and Vegetable Crops, because they have such large acreage under cultivation, own their own equipment.

Of the 10,000 acres available for use by the Cornell University Agricultural Experiment Station at Ithaca, about 3,000 acres are in cropland and about 700 acres in pasture. There are more than 4,100 acres in woods used for research purposes and there are about 2,400 acres in other woods, non-cropland, roads, etc.

In addition to the land area located around Ithaca, there are research farms located as follows: the Long Island Vegetable Research Farm at

Riverhead, a foundation seed potato farm near Lake Placid, a fruit farm at Sodus, an agronomy farm at Aurora, and a 389-acre Biological Field Station on Oneida Lake. Also, test plots are located in forty-five countries to evaluate the results of research under a variety of environmental conditions.

Of the 700 acres of land at Geneva for the New York State Agricultural Experiment Station there, some 320 acres are in fruit and 175 acres in vegetables. In addition to this, there are twenty-eight acres of experimental grape vineyards and laboratory facilities at Fredonia in Chautauqua County and nineteen acres of experimental land and laboratory facilities at Highland in Ulster County for research serving the fruit and vegetable industry in the Hudson Valley. In addition to these, research is conducted on growers' farms in fourteen different counties.

LIBRARIES

The Colleges of Agriculture and Home Economics are served by the Albert R. Mann Library of about 375,000 volumes. This is supplemented by the other libraries of Cornell University, containing over 3,250,000 volumes, many of which also relate directly to agricultural and home economics subjects. In addition to materials on applied agriculture and home economics, the Mann Library contains extensive collections dealing with such related sciences as botany, biochemistry, microbiology, genetics, entomology, and medicine. It also includes large collections in economics, sociology, psychology, and education, and smaller collections on a variety of other subjects. Of major importance are the numerous complete files of foreign and domestic periodicals and government publications, of which some 11,000 are received currently.

The principal collection on entomology and limnology is in Comstock Hall. Small collections of reprints, bulletins, and duplicate books and journals are provided by several departments in their own buildings for use by their faculty and graduate students.

The Albert R. Mann Library building, completed in 1952, has a capacity of 500,000 volumes and 750 reading-room seats. The first floor is devoted primarily to books assigned for class reading, with rooms seating 425 persons. On this floor is a room for small groups studying together, and also the Ellis Room containing books and periodicals for leisure reading. On the second floor are the reference, bibliography and periodical reading rooms, offices and work rooms, the main loan desk, and the card catalog. The catalog provides a record of the library materials in all libraries and departmental collections of the Colleges. The library has a comprehensive collection of bibliographies.

When the University is in session, the library is open, with librarians on duty to assist readers, from 8:00 A.M. to 11:30 P.M. daily except Saturday, when it closes at 5:00 P.M., and Sunday, when it opens at 1:00 P.M. Students must present identification cards when borrowing books. Information on library regulations and suggestions for use of

the library are provided all new students in orientation meetings each fall. More detailed information appears in booklets distributed at that time.

SCHOLARSHIPS

General Information

Scholarships available only to students in the College of Agriculture are listed on the following pages. *Applications for these scholarships should be made on the* Cornell University Financial Aid Form. This form must be supplemented by the parents' confidential financial statement. Entering students must apply before January 15, and students in residence are expected to pick up application forms at the Office of Scholarships and Financial Aid, 105 Day Hall, before spring vacation and to see that these are filed before May 1.

Financial aid in the form of university scholarships, jobs, and loans is also awarded from other funds on a competitive basis to students entering or enrolled in any undergraduate division of the University. Brochures describing this aid are available from the Office of Scholarships and Financial Aid.

Recipients of Scholar Incentive Awards, Regents College Scholarships, Regents Scholarships for Children of Deceased or Disabled Veterans, and Special State Scholarships for Children of Disabled or Deceased Soldiers, Sailors, or Marines, who enroll at the New York State College of Agriculture, may apply the amount of money they receive toward their college expenses.

Scholarships Awarded by the College of Agriculture

ROBERT M. ADAMS 4-H MEMORIAL SCHOLARSHIP. The Robert M. Adams 4-H Memorial Scholarship was established in memory of Professor R. M. Adams by the 4-H Clubs of the state. The endowment yields approximately $50.00 a year. Students who are New York State residents are eligible to apply after their first year in the College, and those who have been 4-H Club members are given first consideration. The award is based on financial need, character, ability, and scholarship.

BEATTY AGRICULTURAL SCHOLARSHIP. The Beatty Agricultural Scholarship fund, a gift of the late Harrison L. Beatty, provides a scholarship of approximately $300 to a student entering the College of Agriculture from the Town of Bainbridge or from Chenango County. Grades in Regents Examinations receive major consideration in making the award.

HENRY H. BUCKLEY STUDENT AID FUND. A fund is provided by the Henry H. Buckley Foundation in memory of Mr. Buckley, a

well-known farmer of Oneonta, New York, who died in 1942. The purpose is to aid worthy students, of any class, who need financial assistance. In making awards, preference will be given to applicants from Chenango, Delaware, Herkimer, Madison, Montgomery, Oneida, Otsego, and Schoharie counties.

WALTER R. CLARKE MEMORIAL ENDOWMENT. The Walter R. Clarke Memorial Endowment in memory of Mr. Clarke, a prominent fruit farmer who lived at Milton, New York, provides a scholarship of $150 each year for a student, of any class in the College of Agriculture, who is primarily interested in fruit growing. Promise of successful work in this field is the basis for an award. Preference is given to students from the Hudson Valley area.

CORNELL-ARGENTINE EXCHANGE SCHOLARSHIP. A male freshman is chosen each May to spend a year at the University of Buenos Aires. Most expenses, other than transportation, are paid by the sponsors in Argentina. In exchange, a student enrolled with the Faculty of Agronomy and Veterinary of the University of Buenos Aires is chosen to come to Cornell to study for one year in the College of Agriculture. His expenses here are paid by the Office of Foreign Students, the College, and students.

Information is available at the Office of Resident Instruction. To be eligible, a freshman must have an average of C+ or above and must file an application by the end of the first week in April. The selection is made by a student-faculty committee.

CORNELL-MEXICAN EXCHANGE SCHOLARSHIP. This exchange with the Instituto Technologico y de Estudios Superiores de Monterrey provides an opportunity for a male junior to spend a year studying at an outstanding technical university in Mexico. The out-of-pocket cost to the Cornell student is estimated at one thousand dollars for transportation, books, and personal expenses. The balance is covered by scholarships from the College of Agriculture and Monterrey Tech, and by a contribution from the Mexican student coming to Cornell.

In exchange a Mexican student chosen by the Monterrey Tech comes to Cornell to study for one year in the College of Agriculture. A comparable part of his expenses are paid by the College and by students.

Information is available at the Office of Resident Instruction. To be eligible, a freshman must have an average of C+ or above and must file an application by the end of the first week in April. The selection is made by a student-faculty committee.

CORNELL POMOLOGY CLUB SCHOLARSHIP OR GRANT-IN-AID. The Pomology Club provides a scholarship or grant-in-aid of $400 each year, to be awarded to a sophomore, junior, or senior student who is specializing in pomology or has major interest in that field. Scholarship and financial need receive equal consideration in making awards, and qualified students are eligible for awards in succeeding years.

CORNELL-SWEDISH EXCHANGE SCHOLARSHIP. A male sophomore is chosen each year to spend his third college year at the Agricul-

tural College of Sweden, Ultuna, Sweden. All expenses except transportation are paid by the Swedish students. In exchange a student from the Agricultural College of Sweden is chosen to come to Cornell, and the students of the College of Agriculture pay his expenses.

Information and application blanks are available at the Office of Resident Instruction. To be eligible, a sophomore must have an average of C+ or above, and he must file an application by the end of the first week in January. The selection is made by a student-faculty committee early in February.

J. CARLTON CORWITH MEMORIAL SCHOLARSHIPS. The endowment fund which supports these scholarships was provided as a memorial to Mr. and Mrs. Corwith by their family, by friends and business colleagues, and by organizations which they had served. The awards are made to men and women of any class who have demonstrated an interest in careers related to the broad field of agriculture.

Selection is based on character, scholastic achievement, potential for leadership in agriculture and financial need.

DAIRYMEN'S LEAGUE COOPERATIVE ASSOCIATION, INC., SCHOLARSHIP. The Dairymen's League Cooperative Association, Inc., provides a $500 scholarship each year for a student who has completed two years in the College with a demonstrated interest in dairy technology or dairy marketing. In addition, students who have completed three years and who are preregistered for student teaching courses in preparation for teaching agriculture in high school are also considered. The final selection is based on character, scholastic record, and financial need, with preference being given to the student who is most likely to make a contribution to agricultural education, dairy marketing, or dairy technology.

WILLIAM FREDERICK DREER FUND. A fund from the estate of William Frederick Dreer has been established to provide a worthy student specializing in floriculture or ornamental horticulture, an opportunity for study and directed practice in foreign countries for approximately one year. The award is approximately $2,500 and is available to either an undergraduate or graduate student within the period of his college course or upon its conclusion. Scholarship, character, maturity, seriousness of purpose, and promise of ability to make contributions to his field are considered in making awards. Applications should be on file at the Office of the Department of Floriculture and Ornamental Horticulture by December 1 preceding the June in which travel will start.

LEONARD A. DUDLEY SCHOLARSHIP ENDOWMENT. The Leonard A. Dudley Scholarship Endowment was established by gifts from Leonard A. Dudley of Binghamton, New York. The income from the fund provides scholarships for members of any class in the College of Agriculture. Awards are made to deserving men or women with demonstrated financial need who are specializing in agricultural engineering, agricultural business, or agricultural science.

In selecting recipients, the Scholarship Committee gives first preference to students from Broome County and second preference to students from Tioga, Cortland, Chenango, and Delaware Counties.

EASTERN FROSTED FOODS ASSOCIATION SCHOLARSHIP. An annual scholarship of $500 has been established by the Eastern Frosted Foods Association. It is to be awarded, at the end of the sophomore or junior year, to a student in food technology. In considering candidates, the Committee on Scholarships gives major emphasis to indications of ability to promote advancement of the industry, with preference to those with special interest in freezing.

EASTERN MILK PRODUCERS COOPERATIVE SCHOLARSHIPS. Three annual scholarships of $250 each are provided by the Eastern Milk Producers Cooperative Association, Inc. Their purpose is to assist worthy students of any class in the College of Agriculture, with preference to be given to sons or daughters of members of Eastern Milk Producers Cooperative Association. In order to qualify, students must rank in the upper two-fifths of their high school graduating class or of their class in college. They must also establish a need for financial assistance and show evidence of outstanding character and leadership ability.

FEDERATED GARDEN CLUBS OF NEW YORK STATE SCHOLARSHIPS. Two annual scholarships of $250 are provided by the Federated Garden Clubs of New York State, Inc. They may be awarded to worthy four-year students in any class who are residents of New York State, who intend to specialize in floriculture and ornamental horticulture, and who are of good moral character. Both need and scholastic promise are considered in selecting the recipients.

GENERAL FOODS FUND SCHOLARSHIPS. The General Foods Fund, Inc., has provided five scholarships for freshmen. The scholarships are for one year and are valued at $400. Students specializing in agricultural engineering, bacteriology, biochemistry, biological science, and in food science and food technology are eligible to apply. The awards are made on the basis of intellectual competency, demonstrated leadership ability, high moral character, and financial need.

GERBER SCHOLARSHIP IN HORTICULTURE. The Gerber Baby Foods Fund, Fremont, Michigan has established an annual scholarship of $500. The scholarship will be awarded to a resident of New York State who will be enrolled as an upperclassman in the College of Agriculture. The selection will be based on character, promise for leadership in horticulture and with equal consideration given to scholarship and financial need. In making the selection, preference will be given to students specializing in agronomy, entomology, plant pathology, pomology, and vegetable crops. The application should substantiate the applicants' interest in horticulture.

HEATLEY GREEN SCHOLARSHIP. The Heatley Green Scholarship Endowment was established under the will of Mrs. Green in memory of

her husband, who had been a New York State farm boy and was a graduate of the College of Engineering at Cornell in the class of 1901. Mr. Green believed strongly in proper training for successful farming, and this scholarship is used to help and encourage worthy undergraduate students of moderate means. Awards are on an annual basis and may be made to one student or divided between two or more students of any class in the College of Agriculture.

HERVEY S. HALL SCHOLARSHIP. The Hervey S. Hall Scholarship, established by bequest of Miss Mary F. Hall of Spencer, New York, and having an annual value of $150, is awarded to a properly qualified student of either sex, a resident of New York State pursuing a course in agriculture leading to the degree of Bachelor of Science, and in need of financial aid. It is "to be granted first to a student from the town of Spencer, New York, should a suitable candidate appear, or a student from Tioga County, or from the State at large."

ANNIE M. HATCH INDIAN SCHOLARSHIP ENDOWMENT. The income from this endowment, established by a gift from Annie M. Hatch, supports scholarships and grants-in-aid to needy students enrolled in any class in the College of Agriculture. Preference will always be given to applications from New York State Indians.

H. J. HEINZ COMPANY SCHOLARSHIP. The H. J. Heinz Company has provided a scholarship for students participating in the Food Distribution Program. The value of this scholarship is $2,000. The student will receive $1,500. The remaining $500 will be used to expand the Food Distribution Program. The award is made on the basis of scholastic achievement or promise, character, financial need, and the student's desire to pursue a career in the food industry. It is not available to students on leave of absence from food companies.

ALFRED C. HOTTES AMATEUR GARDENING SCHOLARSHIP. The Alfred C. Hottes Amateur Gardening Scholarship Fund, a gift of the late Alfred C. Hottes, provides one or two scholarships of $300. Eligible candidates are undergraduate students in the College of Agriculture who, by reason of their academic records, character, and activities, show promise of advancing through their study and work the subject of floriculture and ornamental horticulture as an amateur activity. In the application each applicant should point out how he might be expected to do this.

BURTON A. JENNINGS MEMORIAL ENDOWMENT FUND. The Burton A. Jennings Memorial Endowment Fund was established in memory of Professor Emeritus Burton A. Jennings, a faculty member of the Agricultural Engineering Department from 1922 until his retirement in 1958. Income from the fund is to provide a scholarship or grant-in-aid for a deserving student. First preference is given to a student specializing in agricultural engineering who has completed the sophomore year.

JEWEL T FOUNDATION SCHOLARSHIPS. The Jewel T Foundation has established two $500 scholarships. One scholarship will be

awarded to a senior specializing in food distribution who has a career objective in the food industry. The second scholarship will be awarded at the end of the senior year to a student specializing in food distribution with a career objective in the food industry, and who is pursuing the combined course in the Graduate School of Business and Public Administration.

DAVID KENNEDY JOHNSTON ENDOWMENT FUND. This fund, established by a bequest under the will of Nettie J. Huey, provides scholarships and grants-in-aid for worthy students entering the College, or already enrolled, and specializing in animal science. Preference is given to residents of Venango County, Pennsylvania.

CARL E. LADD MEMORIAL SCHOLARSHIPS. A fund in memory of Carl E. Ladd, Dean of the College from 1932 until his death in 1943, provides a number of scholarships which are open to young men and women from New York farms who are members of any class in the College of Agriculture. The awards are made on the basis of character, financial need, promise for future leadership, and school record.

GEORGE LAMONT EDUCATIONAL FUND. The George LaMont Educational Fund was established by gifts from the late George B. LaMont and his son T. E. LaMont, owners of the LaMont Fruit Farm in Albion, Orleans County, New York. The income from the fund provides one or two scholarships of $300 each, for Orleans County farm boys of good moral character, who have a record in school and out that shows ability and application, and who are in need of financial assistance. Awards are for one year and usually are made only to young men entering college.

LOBLAW SCHOLARSHIPS. Loblaw Incorporated provides two scholarships of $500 to be granted to freshmen students in the Food Distribution Program each year. The scholarships may be retained during four years of undergraduate study provided that the students' academic records are satisfactory.

The award is based on financial need, character, and scholastic record. Preference will be given to employees and children of employees of Loblaw Incorporated. Applicants must identify this relationship on the financial aid section of the application for admission and attach verification from the personnel department of Loblaw Incorporated.

HUDSON H. LYON MEMORIAL SCHOLARSHIP. The endowment for this scholarship fund was established by the late H. H. Lyon of Bainbridge, New York. The income, amounting to about $1,600 a year, is to be used to aid students who are preparing for Protestant Christian missionary service, with preference to those who include agriculture in their training.

ROBERT N. MARSHALL MEMORIAL POULTRY SCHOLARSHIP. This fund, given by friends of Robert N. Marshall, a prominent poultryman, provides an annual scholarship or grant-in-aid to help a deserving student. In making the selection, first preference is given to an entering

freshman who intends to specialize in poultry science. Otherwise, it is to go to an upperclassman in the Department of Poultry Science.

FRANK W. MASON AGRICULTURAL SCHOLARSHIP. The Frank W. Mason Agricultural Scholarship was established by gifts from Frank W. Mason, a prominent fruit farmer of Albion, Orleans County, New York. The income provides an annual scholarship of $200 for a young man or woman from Orleans County, with preference given to graduates of the Albion Central School and those who are interested in fruit growing or marketing. In making awards, consideration is given to need for financial assistance, academic ability, moral character, and promise for future leadership in the broad relationships of agriculture.

W. S. MIDDAUGH-ALPHA ZETA MEMORIAL SCHOLARSHIP. In order to recognize those students dedicated to making a real contribution to agricultural business or international agriculture, the W. S. Middaugh-Alpha Zeta Memorial Scholarship of $500 is granted in memory of Wessels S. Middaugh, '26, who dedicated his life to service through a career in international agriculture.

The award is made to a student who ranks in the upper two-fifths of his class, is of good character, and who has demonstrated leadership ability. Financial need is not considered. Preference is given to members of Alpha Zeta, the national professional agricultural honorary fraternity. Ordinarily, the award is made at the end of the junior year.

FRANK B. MORRISON MEMORIAL SCHOLARSHIPS. An endowment fund, established by Mrs. Frank B. Morrison in memory of her husband, a former head of the Department of Animal Science, provides two annual awards of $300 each. They are made to juniors or seniors of outstanding ability whose major interests are in animal science. A committee from the faculty of the Department of Animal Science considers both academic achievement and personal qualities of leadership and character in recommending awards.

NATIONAL FOOD BROKERS ASSOCIATION FOUNDATION SCHOLARSHIP. The National Food Brokers Association Foundation, Inc., has provided a scholarship for students participating in the Food Distribution Program. The value of this scholarship is $500. The award is made on the basis of scholastic achievement or promise, character, financial need, and the student's desire to pursue a career in the food industry.

NEW YORK FARMERS SCHOLARSHIPS. This fund is provided by the New York Farmers for the purpose of assisting young men with good ability, who need financial aid, to continue their agricultural education. Preference in making awards will be given to farm boys, those who wish to farm, and those who expect to serve farmers directly.

NEW YORK LIME ASSOCIATION SCHOLARSHIPS. The New York Lime Association provides $2,200 each year for scholarships to be awarded to members of the three upper classes. In selecting students for awards major interest in agronomy, scholastic achievement

especially in the sciences, potential ability for leadership, and need for financial assistance are considered, with preference being given to residents of New York State. The awards are normally given for one year but may be renewed if the student qualifies in competition with other members of his class.

NEW YORK STATE HORTICULTURAL SOCIETY SCHOLARSHIP. The New York State Horticultural Society provides an annual scholarship of $500. The award is ordinarily available only to an entering student who is judged on the basis of ability, need, and leadership promise. It may only be awarded to a young man or woman whose parent has been a member of the Society for the past two years. Applicants must identify this relationship on the financial aid application.

ALFRED M. S. PRIDHAM SCHOLARSHIP. The New York State Nurserymen's Association provides an annual award of $500 to encourage outstanding undergraduate students of good character with limited financial means, preference is given to those who are specializing in ornamental horticulture (growing, wholesaling, retailing, or educational fields) and/or landscape design. A student in any class may receive the award on the recommendation of the Department of Floriculture and Ornamental Horticulture.

RALSTON PURINA AIDS TO EDUCATION. The Ralston Purina Company has provided the following three scholarships: *Ralston Purina Scholarship:* The Company offers an annual scholarship of $500 to an outstanding undergraduate student in agriculture. The award is made each year to a student who will be entering his senior year or, under unusual circumstances, his junior year. The recipient must rank in the upper 25 per cent of his class scholastically. Evidence of leadership ability, moral character, participation in extracurricular affairs, sincerity of purpose, and financial need are taken into account in making an award. Applications must be filed by June 1. *Danforth Leadership Training Scholarship for Agricultural Freshmen:* An outstanding freshman is selected to represent the College at Camp Miniwanca, Stony Lake, Michigan. He joins freshmen from other U.S. Land-Grant Colleges and from three Canadian agricultural colleges for two weeks of leadership training in August. Full tuition is paid by the Ralston Purina Company. The selection is made in May from those freshmen with outstanding records in the fall semester. *Danforth Award for Agricultural College Seniors:* An outstanding junior is selected to join representatives from other U.S. Land-Grant Colleges and from three Canadian agricultural colleges for two weeks of study in St. Louis and two weeks of leadership training at Camp Miniwanca, Stony Lake, Michigan, during August before starting the senior year. The Ralston Purina Company pays the expenses for the four weeks, including a travel allowance. The selection is made in April and May each year from among high-ranking juniors.

ROBERTS SCHOLARSHIPS. The Roberts Scholarship Fund, a gift of the late Dr. Charles H. Roberts, of Oakes, Ulster County, New York,

provides five scholarships, each retainable for one year, but not open to entering students. As expressed by the founder, the purpose of these scholarships is to furnish financial assistance to students in the College of Agriculture who are of good moral character, who show native ability, tact, and application, and who are in need of such assistance, especially students coming from rural districts. The awards are made after the close of each year. The present value of each scholarship is $300.

ROHM AND HAAS COMPANY SCHOLARSHIP. The Rohm and Haas Company has established scholarships in the College of Agriculture to encourage outstanding undergraduate students specializing in the Biological Sciences. To be eligible in their junior or senior year, students should be in the upper fifth of their classes. Financial need is a secondary consideration. Ordinarily there will be two awards each year with a value of $500.

AARON H. RUBENFELD MEMORIAL SCHOLARSHIP. The Aaron H. Rubenfeld Memorial Scholarship was established by the Middletown Milk & Cream and Dellwood Dairy Divisions of Deltown Foods, Inc., of Yonkers, New York, in memory of their late president and founder, who believed in actively encouraging progress in the dairy industry. Candidates for this $500 award must have completed their sophomore year in the College, must show evidence of need for the financial assistance, must have demonstrated interest in the dairy industry, and must possess characteristics that indicate potential ability to contribute to improvement in the production, marketing, and manufacture of milk and milk products. With other qualifications equal, preference will be given to children of employees of either of these two companies and of producers shipping their milk to Middletown Milk & Cream Division or its affiliates. Payment of $125 is made to the recipient at the beginning of each semester in the junior and senior year.

LELAND SPENCER DAIRY MARKETING RESEARCH FUND SCHOLARSHIP. The Dairy Marketing Research Fund has established this scholarship in recognition of Professor Emeritus Leland Spencer and his contributions in the dairy marketing field. The scholarship is available to an undergraduate student in the New York State College of Agriculture who has demonstrated his potential for making a contribution in the field of dairy marketing. In selecting recipients, the Scholarship Committee will give special consideration to those who have: completed the work of the junior year; achieved a rank in the upper third of their class; taken courses in dairy marketing, dairy industry, dairy husbandry, and farm management or who have otherwise demonstrated a special interest in the area of dairy marketing.

WARD W. STEVENS HOLSTEIN SCHOLARSHIP. A fund in honor of Ward W. Stevens provides a scholarship to a male undergraduate student in the College of Agriculture, who has completed at least one-half of his course. The value of the scholarship is $750. It may be awarded to one student or divided between two students. A student who

has held the scholarship is eligible to reapply. The award is based on character, exceptional ability in the judging and handling of dairy cattle, high scholastic rank in dairy husbandry courses, need of financial assistance, and special interest in the Holstein breed of cattle.

ULLMAN SCHOLARSHIP FUND. The residue of a trust fund established by S. Edward Ullman supports a scholarship or scholarships for students pursuing as a speciality the study of forestry. The recipients are chosen each year on the recommendation of the professors (not assistant professors) of forestry in the Department of Conservation.

MAY WALKER AGRICULTURAL SCHOLARSHIP FUND. The May Walker Agricultural Scholarship Fund was established under the will of May Walker in gratitude for the assistance given her by the University in 1919 and 1920. An annual award will be made by the Scholarship Committee for the benefit of a student from the United Kingdom or the British Commonwealth who is attending the College of Agriculture. The applicant must clarify his place of residence on the application form.

WOMAN'S NATIONAL FARM AND GARDEN ASSOCIATION SCHOLARSHIPS. The New York State division of this Association has provided the following two scholarships: *A Scholarship in Honor of Its First President, Mrs. Francis King:* The value of the scholarship is $250. The award is made biennially to a woman of the sophomore class in the College of Agriculture, who is then given preference for the award in her junior year. Character, interest in agriculture, scholarship, and financial need are considered. *A Scholarship in Memory of Its Former Honorary President, Mrs. Walter Douglas:* Junior or senior women in the College of Agriculture who have achieved high standing are eligible to apply for the award of $200. Character and financial need are considered, with preference given to girls who have been active in a 4-H Club.

SCHOLARSHIPS FOR NONRESIDENTS. Twenty tuition scholarships are available for nonresidents of the State. They are awarded annually, and evidence of need is required.

Other Scholarships

Information about other scholarships open under certain conditions to undergraduates in the College of Agriculture may be obtained in the Office of Scholarships and Financial Aid, Day Hall.

AWARDS

ALPHA ZETA SCHOLARSHIP KEY. The Alpha Zeta Fraternity presents a scholarship key to the student who made the highest scholastic average in the first year of the four-year course. The name of the

recipient is also inscribed on a plaque in the Office of Resident Instruction. The key is presented at the annual barbecue in the fall.

ALUMNI PRIZES. The Alumni Association of the College of Agriculture provides two annual prizes of $50.00. These are awarded by the faculty, one to the junior who had the highest cumulative average at the end of the sophomore year, and one to the senior who had the highest cumulative average at the end of the junior year.

BORDEN AGRICULTURAL SCHOLARSHIP AWARD. The Borden Company has established an annual scholarship award to recognize and assist outstanding students who give promise of future achievement. The award is made to the student in the College of Agriculture who, upon entering his senior year, has the highest average grade for all of his previous college work of any of the similarly eligible students. (Students in food distribution are not eligible.) The value is $300 payable upon registration in the College for the senior year.

BORDEN SCHOLARSHIP AWARD IN FOOD DISTRIBUTION. The Borden Company Foundation has established an annual scholarship award of $300. All full-time senior students specializing in food distribution shall be eligible. The award shall be presented to that eligible student who has achieved the highest cumulative quality point average for all college work preceding his senior year.

BURPEE AWARD IN HORTICULTURE. An annual award of $100 is made possible through a grant from the W. Atlee Burpee Company, Seed Growers, Philadelphia, Pennsylvania, and Clinton, Iowa. The purpose is to encourage outstanding students in the study of vegetable growing and flower growing. The award is made at the beginning of the senior year and is divided equally between two students, one in the field of floriculture and ornamental horticulture and the other in vegetable crop production. To be eligible, the student shall have completed Biological Sciences 240 or its equivalent, and at least two courses in the department concerned, and shall have signified intention of specializing in that department.

EASTMAN-RICE PRIZES FOR PUBLIC SPEAKING. The Eastman-Rice prizes for public speaking of $100, $50.00, and $25.00 are awarded by a committee of judges to any regular or special student in the College of Agriculture for public speaking on topics of their choice. Elimination contests are held beginning approximately December 1, with the final contest taking place during the spring semester. Contestants sign up before December 1 in the Communication Arts Office, 510 Mann Hall, where additional information may be obtained.

PAUL R. GULDIN MEMORIAL ENDOWMENT. The Paul R. Guldin Memorial Endowment, established by Mrs. Paul R. Guldin as a memorial to her husband, a graduate of the College in 1912, is to encourage undergraduate students in the Colleges of Agriculture and Home Economics to become interested, and to take part, in the development of a more adequate rural leadership. The income supports a

contest for the best original articles or stories, written by undergraduates in these Colleges and published in the *Cornell Countryman,* that contribute to the purpose of the endowment. The awards will be made twice a year, the first award being based on the articles in the October, November, December, and January issues and the second awards on the February, March, April, and May issues. In each instance the awards will be $75.00 for first place, $50.00 for second place, and $25.00 for third place, and $10.00 for honorable mention. The selection will be made by a committee from the faculty appointed by the Dean.

FRANK B. MORRISON MEMORIAL PRIZES. The Frank B. Morrison Memorial Prizes, totaling $100, annually, are given to students winning top awards in the Students' Fitting and Showmanship Contest.

NEW YORK FLORISTS CLUB AWARDS IN FLORICULTURE. Two annual awards of $125 are made possible through a grant from the New York Florists Club, New York, New York.

The purpose of one award is to encourage outstanding students in commercial floriculture (growing, wholesaling, retailing, or educational fields). To be eligible the student shall have a specialization in commercial floriculture and shall have completed the junior year. The award shall be based on the combined average of all courses taken in the University, as well as interest in, and potential for, continuation in the field of commercial floriculture. The award will be made at the beginning of the senior year by the Faculty Committee on Scholarships on recommendation of the Department of Floriculture and Ornamental Horticulture.

The second award is to recognize and encourage an outstanding undergraduate student specializing in any subject area in the Department of Floriculture and Ornamental Horticulture. He should have demonstrated exceptional interest, enthusiasm and leadership and should have given distinguished service to the Department. Academic standing, although important, is not the primary criterion. The award will ordinarily be given to an upperclassman.

CHARLES LATHROP PACK FOUNDATION FORESTRY PRIZE. The Charles Lathrop Pack Foundation Forestry Prize of $40.00 is awarded annually in April for the best essay on forestry submitted by a resident student who has taken some course in forestry during the current college year. The purpose of the prize is to aid in training men and women to write articles that will arouse in the public an interest in forestry and an appreciation of what forestry means to the country. The award is made by a committee appointed by the President of the University. The detailed regulations are furnished by the Department of Conservation. The essay must be deposited at the office of the head of the Department of Conservation by noon on April 15.

RING MEMORIAL FUND PRIZE. The Ring Memorial Fund was established under the will of Charles A. Ring to advance horticultural science. The income is used for a prize of approximately $50.00 to be

awarded to an outstanding sophomore student specializing in plant or horticultural science.

Instructors and advisers of students in the plant sciences are requested to nominate, in writing, sophomores who show promise of advancing horticultural science. Consideration is to be given to grades in horticultural and supporting science courses; attitude toward education, horticulture, and scientific work; demonstrated ability for leadership; character and personality. Nominations must be received at the Office of Resident Instruction before May 1.

SAMUEL L. STEWART PRIZE. The Samuel L. Stewart Prize of $100 is offered annually in an essay contest, to promote the production and distribution of high-quality milk, and to acquaint producers and handlers with the factors which may affect its palatability. The contest is open to undergraduate students in the College of Agriculture. Essays of 600 to 800 words must be filed at the Office of Resident Instruction by May 1.

OTHER PRIZES. Information concerning other prizes open to students enrolled in the University is given in the *Announcement of Prize Competitions*. Copies may be obtained at the Visitor Information Center, Day Hall.

LOANS

A fund contributed by students of the College is available for small, short-time, emergency loans. Applications may be made to the College Secretary.

A fund, the interest on which is available for loans to students specializing in floriculture, has been established by Mr. Max Schling of New York City. Another loan fund for students of floriculture, with principal and interest available, has been contributed by the New York Florists Club. Applications for loans from both these funds may be made to the College Secretary.

For other loan funds, available to students of all colleges at Cornell, application should be made at the Office of Scholarships and Financial Aid, Day Hall.

HEALTH SERVICES AND MEDICAL CARE

Health Services and medical care for students are centered in two Cornell facilities: the Gannett Medical Clinic (out-patient department) and the Sage Infirmary. Students are entitled to unlimited visits at the Clinic (appointments with individual doctors at the Clinic may be made, if desired, by calling or coming in person; an acutely ill student will be seen promptly whether he has an appointment or not). Students are also entitled to laboratory and x-ray examinations indicated for diagnosis and treatment, hospitalization in the Sage Infirmary with

medical care for a maximum of fourteen days each term, and emergency surgical care. The cost of these services is covered in the General Fee.

On a voluntary basis, insurance is available to supplement the services provided by the General Fee. For further details, including charges for special services, see the *Announcement of General Information.* If, in the opinion of the University authorities, the student's health makes it unwise for him to remain in the University, he may be required to withdraw.

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CORNELL UNIVERSITY ANNOUNCEMENTS

The Cornell *Announcements* are designed to give prospective students and others information about the University. The prospective student should have a copy of the *Announcement of General Information;* after consulting that, he may wish to write for one or more of the following *Announcements:*

New York State College of Agriculture
College of Architecture, Art, and Planning
College of Arts and Sciences
Department of Asian Studies
Education
College of Engineering
New York State College of Home Economics
School of Hotel Administration
New York State School of Industrial and Labor Relations
Center for International Studies
Officer Education (ROTC)
Summer Session

Undergraduate preparation in a recognized college or university is required for admission to certain Cornell divisions, for which the following *Announcements* are available:

Graduate School: Biological Sciences
Graduate School: Humanities
Graduate School: Physical Sciences
Graduate School: Social Sciences
Law School
Veterinary College
Graduate School of Business and Public Administration
Graduate School of Nutrition
Medical College (New York City)
Cornell University–New York Hospital School of Nursing (New York City)
Graduate School of Medical Sciences (New York City)

Requests for the publications listed above may be addressed to
CORNELL UNIVERSITY ANNOUNCEMENTS
Edmund Ezra Day Hall, Ithaca, New York 14850

(The writer should include his zip code.)